



IMPERIAL AGRICULTURAL  
RESEARCH INSTITUTE, NEW DELHI.







# JOURNAL

OF THE

ROY

# STATISTICAL SOCIETY.

Founded 1834

Incorporated by Royal Charter 1887

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VOL. XCIV.—YEAR 1931.

(NEW SERIES)

Accession No	344.
Date	.....—1931/2

LONDON:

THE ROYAL STATISTICAL SOCIETY

9, ADELPHI TERRACE, W.C. 2.

1931.

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# JOURNAL

## OF THE ROYAL STATISTICAL SOCIETY

PART I, 1931.

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THE INAUGURAL ADDRESS OF SIR JOSIAH CHARLES STAMP, G.B.E.,  
LL.D., D.Sc., F.B.A., DELIVERED TO THE ROYAL STATISTICAL  
SOCIETY, NOVEMBER 18, 1930.

### THE NATIONAL CAPITAL.

SIR JOSIAH STAMP said: I have to announce two very interesting matters that have already been made public at the Annual Meeting. The first is that the Council awarded to Mr. H. E. Soper the Guy Medal in silver, for his paper on "The Interpretation of Periodicity in Disease Prevalence," and for his contribution to the development of statistical method, particularly his work on "Frequency Arrays." Most Fellows present know that Mr. Soper had died since that announcement was made, and by his death the Society has lost a most valuable member. Statistical science has lost a worker in a field in which workers of his ability are few; they often work without honours of a spectacular or public order, and the kind of recognition that the Society can give is really a trust in the interests of science. The medal will now be handed to Mr. Soper's sister, with an assurance of the Society's renewed esteem for all the services he rendered to statistical science, and with a word of particular sympathy to the family in their more intimate bereavement.

The Council have also made another award, that to our ex-President, Mr. Flux, of the Guy Medal in gold, in recognition of his distinguished and zealous work for the Society and for the furtherance of statistical science, which has included the contribution of many valuable papers read at the meetings and published in the *Journal*. This award is one of very great distinction; it has only been given seven times in forty years, and there are only two recipients living at the present day.

One has only to think of the great range of Government statistics over a long period, covering three Censuses of Production, and the

many new and valuable developments for which Mr. Flux has been responsible, to realize that this award is something in the nature of a national recognition of his work.

If I may be forgiven a personal note, there is for me a peculiar satisfaction and pleasure in being the vehicle of this presentation, as I made my first excursion into economics under Mr. Flux's tutelage, in his *Economic Principles* many years ago, so that had he been less persuasive and less attractive, I might have sheered off into some other field of knowledge, and I should not be here to-night. Then a little later, from actual contact with Mr. Flux in his official work, I have learned a great deal about the true ideals of precision and firm unbiassed basis for one's work—four-square to the winds of public and political desires, which have always animated him. In the third place, in Mr. Flux's work for the Society, as a fellow-officer over a long period of years, I have realized that as long as the purity of the traditions of the Society are in his keeping they are perfectly safe, yet at the same time he has always made the Society's activities progress with the needs of the day. It is this threefold influence upon my own life that I gladly acknowledge in making the presentation of the Guy Medal in Gold to Mr. Flux.

I cannot adequately express to the Society my sense of the honour that has been done me in my election to the high office of President. I have only to glance over the names of my predecessors during the past ninety-six years to appreciate all that the associations of this office imply, for no higher distinction can be conferred upon any worker in statistical science, or upon any man in public life who acknowledges the value of that science in the conduct of public affairs. I am proud of having risen from the ranks and received this preferment before the end of the second decade of my fellowship. When I look at the giant statistical stature of recent occupants of the office who had been similarly promoted, I make no pretence, even to myself, that my elevation is a mark of that kind of technical worth. For when I feel overawed by such kinship with Shaftesbury, Russell, Gladstone and Goschen, I turn to the line of Newmarch, Booth, Edgeworth, Yule and Flux, and I am no less abashed. Therefore I only reflect that if a real concern for the well-being and high standing of the Society, and an affection for its traditions and associations, can confer any title, in that sense, at any rate, I may have some merit. And no President can ever have entered upon the office with a greater sense of a debt to be paid than I do, for what I owe to the stimulus and help of the Fellows and Officers, the *Journal* and the pure disinterestedness of all the Society's work, in my own mental development, I cannot overstate.

The past year has been one of progressive usefulness, without any

outstanding events to mark it in the history of the Society. It is coming more and more into touch with the activities of the world outside, and it is more and more relied upon as a source of guidance and a repository of accurate information. The growing use of statistical method in business is reflected in the increase in the number of Fellows and the wider field of usefulness of the Society's *Journal* throughout the world.

My predecessor, in his inaugural address, gave some most interesting details regarding the statistics of the Society's Fellowship over an extended period. I will, therefore, content myself here with saying that the numbers are being well maintained, despite the heavy loss through the death of many of the older generation. These losses include some notable names—no fewer than three former Presidents, Sir Alfred Bateman, Major Craigie and Sir Henry Rew, having gone from our roll. During the year, too, we have sustained a grievous loss in the deaths of Mr. Sanger and Mr. Soper, who gave valuable service to the Society, and will be greatly missed by us.

One of the most inspiring factors of the present situation is the number of young men and women who are becoming Fellows, and in these I am sure there will be worthy successors to the great names that have passed away. In this connection the formation of the Study Group amongst the younger Fellows for mutual help and education is of great significance. We hope that forthcoming *Journals* will give evidence of the real value of their activities. Our meetings have continued to deal with subjects of great and immediate social importance, and I think, apart from their value to us, they will be poignant evidence to generations to come of our present difficulties. The Measurement of Tariff Levels, the Limits of Industrial Employment, papers on Iron and Steel, Coal and Cotton—together make up a solid contribution to an encyclopædia of industrial affairs.

My predecessor began his Presidential year with a Survey of the National Income, and correlated his own results with those reached by other methods by Professor Bowley and myself for 1924. It is with some trepidation that I embark upon a consideration of the kindred field of the National Capital. No real attempt to cover it in detail has been made since the war, although the literature upon war wealth and the capital levy from 1918 to 1923 brought forth a number of rough estimates, directed rather to determining the amount that would be involved under schemes of taxation than to the more far-reaching question of the amount of wealth in a more absolute sense, either in these islands or belonging to these islanders. In my Newmarch Lectures of 1920 I set out the reasons why such

an estimate was then well-nigh impossible, and even to-day those reasons have not lost all their force. For 1914 I was able to make the estimate, since generally accepted, of £14,300 millions, with an extreme margin of doubt of about 13 per cent. But to-day the possibilities of accurate estimation are much more limited. In the first place, the conditions year by year have had nothing like the old or pre-war stability, in interest rates, and in general economic conditions. In the second place, the published income-data upon which to work are given in a much less detailed classification; and in the third, some of the problems of principle, introduced by the special weight of the public debt, and by the facts of rent restriction and housing subsidies, are well-nigh metaphysical in their subtlety and elusiveness.

The figures on which the National Income is estimated are definite for a particular period of time, whereas the National Capital requires not only such a definite time basis, but also an "outlook" for capitalization of the figures of income. It is obvious that by the time the income figures have become available to us the capitalization outlook existing during the period to which they actually related may have completely changed. Indeed there has been no point of time since the war when the outlook existing *at the period* over which any particular figures extended has not been completely falsified at the time of availability.

For several years after the war the income figures were seriously affected by the Excess Profits Duty payments, and by post-war inflation and the subsequent slump. The profits for the relatively normal year 1924 could not be dealt with in 1926 on the ideas of 1924, because in 1926 the changes due to the reintroduction of the gold standard and serious industrial troubles had altered the whole outlook. Now the future outlook existing in 1928 cannot easily be applied to the figures of 1928, because 1930 has completely changed in the rates of interest and other capitalizing factors. But at some point or other, we must frankly make the attempt, even though the capitalizing factors are out of date.

The elimination of Southern Ireland from the figures presents some statistical problems, especially for comparative purposes.

Some of the older Fellows of the Society will remember that before the war we had an exciting hunt for a large missing piece of National Capital, between the estimates arrived at by the direct or "Giffen" method and those given indirectly from the data upon estates, with a "Multiplier" computed by Sir Bernard Mallet and Mr. H. C. Strutt. This led to many refinements of the "Multiplier," and much discussion of the effect of *inter vivos* giving. I made some attempt in 1916, in *British Incomes*, to account for the

difference, and later in the *Economic Journal*, 1918, in *The Capital Wealth in the Hands of Individuals*, and I think I then set forth the true reason why there must always be a difference between the two methods, because what they are really attempting to measure is not actually the same thing. So long as businesses set aside considerable sums in secret or even in open reserves, an aggregate of the valuation of shares arrived at by stock exchange methods (the Estate and Multiplier method) will rarely be the same as a total valuation of the business as a whole, as a going concern (the direct or Giffen method). This factor of difference was given greater precision in the evidence before the War Wealth Taxation Committee in 1920. We are now in a position to consider what gap between them is a reasonable one, and the different totals can be brought into the area of reasonable mutual support rather than of incessant challenge and cynical mutual destruction. It would demand an undue prolongation of this address for me to give the arithmetical data for a new computation of the "Multiplier" with the latest death-rates in the different age groups, and in different social classes. Moreover, the ground has been covered recently in Mr. J. C. Wedgwood's *Economics of Inheritance*.

Mr. Wedgwood's calculation of the "Multiplier" was 34 for 1924, but he raised it to 37 to allow for different death-rates in the upper and middle classes, and applying it to 1925-6 values reached a figure of £18,000 million (including an estimate of £1,000 million for those under the Estate Duty limit). "This figure of course includes War Loan and excludes communal possessions, and is not comparable with estimates of the value of concrete capital possessed communally and individually by the inhabitants of Britain." The Estates passing in 1928-9 were £525 million against £456.3 million in 1925-6, so that Mr. Wedgwood's figure brought up to date, *pro rata*, would be £20,050 million with a lower limit, if his correction of the arithmetically ascertained multiplier is not justified by facts, of £18,500 million. These figures apply only to Great Britain and do not include Northern Ireland.

British Government securities account for 13 $\frac{3}{4}$  per cent. of wealth passing, and therefore the elimination of this pseudo-wealth reduces the figures to £17,300 million (lower limit, £15,750 million).

In writing upon the National Capital in 1921 I set out the following uses to which estimates of the National Wealth and Income could be put :

(1) Tests of "progress" by way of comparisons between different years, to show the accumulation of capital; tests of the distribution of wealth, according to the form or embodiment which wealth

takes; of the effects of changes in the rate of interest or in the value of money.

(2) Tests of the relative "prosperity" or resources of different nations or communities, either as a whole or per head of the population, and in relation to their national debts.

(3) Comparisons of income with capital and property.

(4) Considerations of the distribution of wealth according to individual fortunes, and changes in that distribution.

(5) Consideration of the applicability and yield of schemes of taxation, *e.g.* the capital levy.

(6) Questions relating to War indemnities.

I then dealt with the different considerations arising on these different uses, and I may repeat the distinctions between the two chief definitions of National Wealth: "The wealth of a country may mean *either* the value of the objects found within its boundaries, *or* the wealth of the inhabitants, including their foreign possessions, and excluding wealth within the country held by people abroad. The confusion between these two ideas has played havoc with discussions on such subjects as the "Taxable Capacity of Ireland." It is the latter sense—the wealth of the inhabitants—that is mainly under consideration. That aspect is foremost when questions of taxation are prominent, but there are matters, such as the inalienable wealth of a country in a geographical sense (for warlike purposes) for which the former is important. A colony capitalized from the home country may be poor judged by the wealth of its inhabitants, but rich in its resources and the actual yield within its borders."

I then took up the estimate for 1914 given in *British Incomes and Property*, £14,319 million,  $\pm$  £1,867 m., and examined the reasons for differences between this and other estimates that had been made for that year. And I referred to the re-examination in 1918 in the *Economic Journal* from quite a different angle, that of wealth available in the hands of individuals, in corroboration. I criticized adversely the rough estimates made by Mr. Crammond and Lord Arnold of £24,000 million for post-war wealth, made by pushing up an unsatisfactory pre-war estimate by the change in the price level, and then adding the whole war debt. My own conclusion for 1920-21 after giving all the defects in material and difficulties of principle then existing, when "values" were changing most rapidly, was as follows:—"While I prefer to give no estimate of capital wealth at the present time for the reasons stated, I should like to add that, in my judgment, it cannot *exceed* 19 to 20,000 million pounds, and is probably much less.

"The aggregate of individual wealth has moved from 11,000 millions in 1914 to about 15,000 millions at June 1920. Of course these are merely expressed in money values—the increase in real or intrinsic values is certainly almost negligible."

The question of the inclusion of the National Debt, except as income in the hands of individual holders, has always been recognized as a difficult matter. With the magnitude of the debt to-day the difficulty has not become less, but the importance of facing it has become greater. Giffen thought the effect of capitalizing the whole of Schedule "C" would be to reckon the debt "twice over":—

"The National Debt is a mortgage upon the aggregate fortune of the country. As we may assume it to be practically all held at home, we may reckon up our whole estate without deducting the debt, whereas we should have to deduct it if it were held by foreigners; but while we do not deduct the debt from the total of our estate, neither can we add it without falling into error." At a later date he modified this view:—"Of course, to each individual holding a portion of the National Debt, the holding is property. . . . On the whole the reason assigned is a good one. But I should not censure very much anyone who included the debt as a part of the capital of the community . . . the money expression of all the other capital of the community is less than it would otherwise be by the amount of the debt . . . if there were no debt, lands, houses, etc. would exchange for rather more than they now do. The debt in this view represents a certain distribution of part of the capital of the country, and we do not get a complete view of the capital unless we include it."

It must necessarily become of importance when we compare our figures with those of other countries or with those of other periods for our own country, and different people have made different computations. In 1914 I followed the practice of deducting the debt from the value of national and local property. After having included the income in the hands of individuals, my comment on it in *British Incomes* was on the following lines:—"If we raised money individually for war, by borrowing from persons with loanable resources, on the security of our possessions, the position would be that there would be an annual interest charge upon our incomes, *from which we should deduct tax*, and the recipients would have no "income" to return for taxation. Thus the capitalization of our property values would cover the capital of the lenders. If the capital lent had not been blown away in shot and shell, it would be represented by additional capital, goods, and permanent expenditure, which would come into the national valuation, but, as it has disappeared, no such



additional capital appears. So if a nation's savings are accumulating at the rate of £300,000,000 per annum, and a war breaks out which is just financed by these savings for three years, the total valuation should remain constant for those years. It would remain constant by the method indicated. But in fact we do not pay this interest as such—we pay taxes—and to capitalize the interest received out of those taxes is to add to the national valuation where there is no real addition; *unless the value of all incomes* (or the number of years' purchase) *has pro tanto, fallen*, the result will be too great. Giffen rather suggested as his view that such a depression in value exists. If our values were settled by a foreigner, with catallactic brain, seeking an income in Britain or elsewhere, the existence of this non-beneficial or onerous charge would lower his estimation of possibilities here relatively to countries with no such burden, other things being equal; but as most eligible competitors would have similar drawbacks the difficulty is minimized. However, values are mainly determined by internal competitive considerations, and although a differential burden upon ownership of capital with no burden upon earnings might alter their relative positions, the fact that *this burden* is fairly distributed on both classes with no possibility of shifting leaves the relative values unaltered. Values as a whole, however, might change relatively to the general price medium, gold; but, even there, credit facilities have such a much larger bearing upon that issue that a depression could be easily offset by a more highly developed credit system. "Altogether it appears probable that any effect of a long-standing debt, like in character and amount to those generally found, would be, if existent, in the direction of depressed values, but certainly not *pro tanto* with the debt involved. It is therefore duplicating values almost to the entire extent to add Consols to the full fee simple value of national property." I went on to point out, however, that the National Debt was a mortgage upon earned income and upon unearned income, both being subject to tax for the payment of interest, and suggested that it might only be necessary to reduce the value of real property by the proportion of the debts secured thereon instead of by the whole debt. On the whole, I still adhere to the principles I then laid down.

But so long as the taxation raised from consumption, wages, salaries and non-capitalizable items leaves no margin over the expenditure which may be regarded as directly benefiting these sources rather than capital assets, then it is convenient to consider that the repayments of mortgage and even the interest thereon are charged upon capital assets. Viewed in another way, if repayments of debt are wholly covered by the yield from estate duties, then

the theoretical "spread" over all classes of earning-power is of less importance.

When we are discussing National Income the difficulty is not so great, because we can consider the volume of material goods as a "flow" during the year, and reflect that the debt charge merely alters its ownership and does not increase the quantity of goods. We can, therefore, as was done by Dr. Bowley and myself, express the total in two forms, one of which for certain calculations includes the individual incomes from interest and pensions, while the other excludes them. One American writer has, however, elected to consider that the debts and debt charges are wealth and income respectively in an absolute sense, inasmuch as they have created an "asset" of security due to the war, but my answer to this is that the security or asset created has no relation whatever to the duration of the war, and to its cost, and, moreover, that the security is reflected in an enhanced multiplier, that is, a general lower rate of interest applicable to all other incomes, which increases their capital value. To add in the cost of the war is, therefore, to duplicate the value, or make an excessive aggregate.

Now that we have expenditure on such a terrific scale to account for, we must ask seriously whether the general capitalization process of British profits is not seriously affected by the existence of heavy taxation for the debt. If it is, then the capitalized value of our assets in general is lower than it would otherwise be; but I do not think that we can trace with any certainty that this is the fact by comparison with France, Germany and the United States. Obviously, however, the case can be reduced to an absurdity, for if the tax was still much heavier, the profits prior to taxation could not be capitalizable on so high a figure as now. The sale of our assets to the independent foreigner would undoubtedly amortize the burden. This may, perhaps, show itself in the reluctance of a foreigner to buy an English investment bearing the heavy income tax, except that we disguise it under the grievance of double taxation. But inasmuch as this is a mere piecemeal consideration, and the purchaser of the whole of Great Britain does not, *de facto*, exist, the balance of convenience is not to try to quantify such an elusive factor; it means a hypothetical increase in the rate of interest used for capitalizing. The matter is perhaps seen a little more clearly in perspective if we consider the case of a town very heavily rating its property and using the money (*a*) to pay the interest on the cost of a communal building, or (*b*) to pay heavy doles with no tangible result. If we were, from outside, paying a sum of money for such a town, we should, at any rate, during the period while the interest and sinking fund were being raised through the rates, add in the

value of the town property created and deduct the outstanding debt, and we should assume that the extent to which the values of property in general were depressed by the excessive rates charged was offset by the extent to which those *values were enhanced through the usefulness* to them of the buildings, etc. When, however, the whole debt was paid off and the rates reduced, the valuation of the new assets would remain the same, but the purchase price of the town would have increased. This matter is analysed further in Appendix II.

### *Sources of Material* (vide Appendix I).

The first basis of the direct valuation is, of course, the income brought under assessment to Income Tax by the Inland Revenue Department, and I take the last published report for the year ending 31st March, 1929. The assessments are those made in 1927-8, and although they include some assessments made for previous years, assessments relating to 1927-8 will continue to be made for some years to come, and, broadly speaking, the assessments made *in a tax year* tend to approximate to those *for a tax year*.

I am not overloading this address with the details of all the computations, or with minor considerations which have already been dealt with at length elsewhere. Moreover the treatment is broad, inasmuch as it is idle to burden you with meticulous points in certain parts, the exactness of which is lost in relation to the large approximations which alone are attainable in other parts of the field. I have therefore been content to give most of my space to considerations of principle which are introduced into the valuation procedure for the first time.

### *Real Property.*

For the houses assessed under Schedule A we have two sets of statistics divided for the three areas, (a) the annual values of 1927-8 and (b) the new property first assessed in 1928. The gross figures are first taken, reduced by the items of repairs and the reductions and discharges, and we reach net figures of £220 million for England and Wales, £23.5 for Scotland and N. Ireland. The multipliers used for getting the gross capital values are taken as the average number of years' purchase for freeholds (Table 16), 17.5 and 11.7 respectively, applied to the net values, give us a total value of £4,125 million, or with the new houses built in the year 1928, £4,238 million. The figures arrived at by using the gross figures (less over-charges) are materially less, though for technical

reasons are to be preferred. Now these results are markedly low judged by any test of the comparative cost of houses before the war, and at the present time for middle-class property, so I deliberately choose the higher figure, especially since the multipliers are low according to tests by Building Society valuations. The gross total in 1914 was £232·6 million (to include the whole of Ireland), and the multiplier 17·4, so that the values have risen by about 60 per cent., but the combined multiplier for the net is reduced to just below 17. But the difference between gross and net now is much greater than before, owing to the very high cost of repairs as a proportion of annual value. Weekly property is largely subject to rent restriction, and with high rates of interest to-day, the capital value to purchase is kept very low. The very large houses sell at low rates and their liability to remain empty is considerable. Business premises are not materially advanced in amounts in the Schedule A assessment, but inasmuch as any residue of value merely goes to swell the profits under Schedule D, any loss of value here is made up elsewhere. The treatment of restrictions and subsidies is now doubtful. The economic effect of restriction was examined by me at some length a few years ago in *Current Problems in Finance and Government*, p. 114, and I concluded:—"The restriction of rents is a transference of wealth, but it is in a measure a transference of wealth to the community as a whole at the expense of the landlord classes. The idea that the wage-earner is enjoying something that has been filched from the property owner must be considerably modified." The bearing of this upon capital values is that if the income from rents here restricted gives a restricted capital value, the unseen enhancement of other people's incomes elsewhere, when capitalized, tends to balance the deficiency. In so far as it is an enhancement of non-capitalized earned incomes, it of course fails to come out at other points in the wealth valuation; the purchasing power of the worker may indeed be increased thereby for other things, but this increase only takes the place of the purchasing power which the house-owner would have exercised, and there is no *net* addition to purchase of goods *other* than house service, and, therefore, no increased trade profits. The best way of putting it is that a large number of people have small unseen additions of beneficial occupation to their incomes that represent the difference in actual and potential rent which is visible immediately, when, on a change of tenancy houses are decontrolled. These unseen items are not capitalized. The subsidies represent perhaps a contribution to cost which is not to be permanently reflected in capital values, although if the price of building had remained as high as when the majority of post-war houses were put up, the rents paid on subsidized houses

would have been low enough to allow of a hidden beneficial occupation to the tenants in the same way. Meanwhile much of the public debt remains which has allowed this condition to exist, and if it is treated as capital in the hands of lenders and deducted again as a communal debt, with no corresponding physical asset, we shall virtually have taken the line that the subsidy itself has added nothing to the national wealth.

On the whole, I am disposed to think that house property, including all buildings, except farm buildings and such buildings as railway property, should be put at a figure of £4,500 million.

Coming now to land (which includes farm buildings and farm houses, tithe rent charges, woodlands and sporting rights), there is a gross total of £51 million, the figures for Great Britain having advanced upon 1913–14 by only about 12 per cent. This is reduced to approximately 45·5 m. £ for actual assessment and 38 m. £ after allowing for repairs. The multipliers are 17 and 21½ respectively, but the margin between the freehold gross and net annual values to which these figures apply is different from the margin between gross and net for income tax, since it includes, besides repairs, tithe and all kinds of other charges. The application of 17 to the gross gives £773½ million, and the *net* multiplier, suitably modified for these different conditions, does not give a very divergent result. But it is doubtful whether this method brings out enough for the values of undeveloped sites, and I put the total accordingly at £950 m.  $\pm$  75. (The greater figure of 1914 is accounted for by the substantial agricultural land values of the Irish Free State then included, and by the much higher multiplier due to the lower general rates of interest.) (The astonishing variations in the number of years' purchase and the resultant capital values at different times in the past eighty years are commented upon in detail in *British Incomes*, p. 381, etc.)

The value of *farmers'* capital is discussed in *British Incomes*, and I have taken a conservative figure now in £450 m.  $\pm$  40, having regard to the 1928 level of prices. (*The Agricultural Output of England and Wales*, 1925, gave £815 m. for the land and £365 m. for the farmers' capital.)

### *Trading profits assessed under Schedule D.*

It is at this point we meet with the largest single mass of the national wealth. Many of the old details are lacking, notably the division into Joint Stock Companies and private businesses, which greatly helped pre-war computations; but certain new features give some assistance. The chief figures are:—

	England.	Scotland.	N. Ireland.	Total.
Manufacturing Productions and Mining Industries ... ..	425·43	43·28	4·06	472·77
Distribution, Transport and Communications (excluding Railways) ... ..	412·46	38·90	5·54	456·90
	<hr/> 837·89	<hr/> 82·18	<hr/> 9·60	<hr/> 929·67
Deduct Wear and Tear ... ..	64·96	6·74	0·77	72·48
	<hr/> 772·93	<hr/> 75·44	<hr/> 8·83	<hr/> 857·19
Deduct for Retail and small businesses not run by limited companies ... ..	...	...	...	250
				<hr/> 607
Deduct also—proportion of overcharges ... ..	...	...	...	127
				<hr/>
Net sum to be capitalized ... ..	...	...	...	£480 m.

Before proceeding to deal with this by reference to Stock Exchange valuations, it will be well to look at its "share" composition. For this purpose I use the large sample published quarterly in the *Economist*, under the title "Industrial Profits," and that most closely approximating to the assessed profits in question is the total of the accounts published in the year to June, 1928.

The sample has the following total capital:—

Debenture . . .	£402·18 m. paying 5·1%
Preference . . .	602·01 „ „ 5·5%
Ordinary . . .	998·72 „ „ 10·5
	<hr/> 2002·91

The total profits are divided:—

Debenture Interest . . .	£20·51 m.
Preference „ . . .	32·88 „
Ordinary „ . . .	104·64 „
To Reserve „ . . .	35·82 „
	<hr/> £193·86 „

which equals 9·67 per cent. on the whole capital. If the sample of shipping and tramways is taken out, it is almost exactly 10 per cent. Nothing can be done with this as a multiplier, however, since it refers entirely to the yield on normal and subscribed capital, and does not indicate the market value capitalisation:

The assessed profits will on this basis be divided thus :—

Debenture Interest	.	.	.	51
Preference	„	.	.	81
Ordinary	„	.	.	259
To Reserve	„	.	.	89
				<hr/>
				480
				<hr/>

But if we remember that the assessed profits do not include the annual value of all property and the income from outside securities which often represent the reserve funds, while both of these come into the sample profits, it is probable that the debenture interest would nearly be met by these two sources. Then the total is better divided :—

Preference	.	.	.	.	91
Ordinary	.	.	.	.	289
To Reserve	.	.	.	.	100
					<hr/>
					£480 m.
					<hr/>

In order to determine the multiplier for this main group for commercial and industrial profits, I have taken Stock Exchange lists of quoted securities during 1928 and classified them according to yields under the main headings of debentures, cumulative preference and preferred shares, and ordinary shares, in a large and haphazard sample. I have also, for the purpose of closer inspection, divided them into those where the issue of stock is under a million pounds, and those where it is a million pounds or over. I have carried the sample sufficiently far to get reasonable statistical regularity, and the table below shows that in each case the mode of the larger class is a definite percentage yield below the mode of the smaller class, no doubt due to great negotiability of the larger stock, greater publicity, and probably also to more definitely known reserves and future potentialities of the large concerns. In each case the weighted average is not very different from the mode. Debentures show a weighted average in the smaller class of just under 5·9 and in the larger class of 6. The cumulative preference shares yield in the smaller is 6·66 and in the larger 6·1, or, taken together, 6·56; in the ordinary stock, over 7 for the small and only 5·1 for the large, due to a disproportionate number in the lowest yielding stocks, and in these presumably future prospects were the main factor in price. The average for the ordinary shares over all is about 6·7 per cent.

YIELD PER CENT. ON PRICE.	DEBENTURES.		CUM. PREFERENCE AND PRT. SHARES.		ORDINARY SHARES.	
	Under 1 m. £.	1 m. £ and over.	Under 1 m. £.	1 m. £ and over.	Under 1 m. £.	1 m. £ and over.
Up to 4 ...			4	1	17	12
Over 4 to 4 <sup>10</sup> ..	2				11	5
„ 4 <sup>10</sup> to 5 ...	7		2	2	17	14
„ 5 to 5 <sup>10</sup> ..	38	11	19	12	15	8
„ 5 <sup>10</sup> to 6 ..	42	7	49	10	18	6
„ 6 to 6 <sup>10</sup> ..	17	6	58	8	18	14
„ 6 <sup>10</sup> to 7 ...	14	4	56	6	33	4
„ 7 to 7 <sup>10</sup> ...	5	1	25	7	22	4
„ 7 <sup>10</sup> to 8 ...	5	1	21	1	30	1
„ 8 to 8 <sup>10</sup> ..	1	0	8	2	17	3
„ 8 <sup>10</sup> to 9 ...	1		7	1	16	
„ 9 to 9 <sup>10</sup> ...			9		16	
„ 9 <sup>10</sup> to 10 ...			3		12	
„ 10 to 10 <sup>10</sup> ..			1		4	
„ 10 <sup>10</sup> to 11 ...					2	
„ 11 to 11 <sup>10</sup> ...			2		2	
„ 11 <sup>10</sup> to 12 ...					1	
„ 12 to 12 <sup>10</sup> ...	1		1		1	
	133	30	265	50	252	71

Now it must be remembered that these multipliers cannot be applied simply to the aggregate profits as now divided, for two reasons. In the first place, the aggregate profits assessed under Schedule D exclude two of the most secure elements, viz. the business premises assessed under Schedule A and the business reserves invested in securities outside. These two items together will be very considerable and go far to meet the lowest yield classification of debenture interest, which is about one-fifth of the whole. The proportion of the assessed profits, therefore, to be dealt with by the lowest multiplier is very small. In the second place, the assessed profits include the whole of the sums put to reserve in the year, and to these no multiplier at all can be attached, though they enter into the Stock Exchange values of the ordinary shares, and, of course, to some extent of the preference. As a result of these considerations we can either apply these multipliers direct to the appropriate portions of the assessed profits, or we can adjust the multiplier and make it appropriate to the whole of the assessed profits—two ways of doing the same thing. In the one case we make the following multiplications :

$$£91 \text{ m.} \times 15.3 \text{ y.p. and } £289 \text{ m.} \times 14.9 \text{ y.p.}$$

and in the other we adjust the total multiplier as follows :

$$11.88 \text{ y.p.}$$



They bring out the Stock Exchange value of these assessed profits to £5,700 m.  $\pm$  225.

The next group is the Retail Distribution (part of the general item of £456·9 m.). This is taken at £250 m. as an estimate which I form on my old acquaintance with the existing proportions, and the net figure, after deducting a proportion of the overcharges, is £210 m. This I should divide as to individuals and firms £160 m., and as to companies £50 m. The £50 m. is capitalized on the same basis as the other businesses, say £600 m. The £160 m. is represented by an enormous number of people, probably upwards of half a million, with a very small amount of capital each, for the major part of each assessment represents personal earnings. The Giffen method was to capitalize at fifteen years' purchase one-fifth of the profits, and I should put the capital at about £350 m., making £950 m.  $\pm$  100 in all for this group.

*Finance, Professions and other Profits.*—£194·2 m. less £39 m. for reductions = £155 m., of which the proportion for professions is about one-fourth. Finance business should then be about £116 m., capitalized at £1,400 m.  $\pm$  100, and the balance for professions, at between one year and a year and a half, since we do not capitalize purely personal goodwill, = £50 m. This group, therefore, totals to £1,450 m. and the total valuation of these three groups of profits, up to this point, is  $5,700 + 950 + 1,450 = £8,100$  m.  $\pm$  425.

#### *Unrevealed Values.*

Now although we have avoided Stock Exchange capital or dividends, and taken actual profits to be multiplied, we have not yet valued the businesses as going concerns, with full inside knowledge, but only according to Stock Exchange knowledge, and with that discounting of the portion of profit not paid out, compared with cash dividends, which goes on in the investor's mind.

In the old days this valuation of profits by Giffen and others proceeded simply by way of a multiplier for all profits without the process of referring it to the test of actual facts which is now incumbent upon us. I do not apologize, therefore, for this detailed variation of time-honoured method.

There is an official note upon this subject of "unrevealed value" in the Appendix to the Report from the Select Committee on Increase of Wealth (War) 1920, p. 255, Memo. No. 5 which deals with it very fully, and the only feature that has been modified since, in my judgment, is the greater extent to which the stock market prices have "picked up" the unrevealed value, owing to the rising public estimation of future capital appreciation, as against immediate cash dividends, under the pressure of high direct taxation, and of stock

exchange operations as a high-class pastime. This was carried to such a pitch in New York recently that it is quite certain in many cases the public put a higher estimation upon share prospects than any purchasing management, taking the whole business and being responsible for earning dividends thereon, would have done, and therefore the margin between aggregate share values and the "going concern" values was all the other way. In the three actual examples given in the official note, the excess of assets over market capitalization, in 1918, of £1,800,000 was £380,000, or 21 per cent. Now these were picked cases to illustrate a principle and not to point to a mode; they are for a year of great instability when the net valuation of assets would most certainly give too favourable a view of goodwill, and included many fixed assets at high purchase prices. I should, therefore, hesitate to put unrevealed value in 1928 at higher than  $7\frac{1}{2}$  per cent. That it existed to a material extent I have no doubt whatever, for in the past twelve years I have been personally involved in the acquisition or sale of some scores of businesses upon the basis of inside knowledge and accountancy, and have therefore a distinct impression of the order of magnitude of this factor.

Applying this conclusion and adding  $7\frac{1}{2}$  per cent. to £7,700 m., the total of £8,100 m. for these profits becomes £8,675 m.  $\pm$  635. The next group is Railways in Great Britain and Northern Ireland, and this is capable of very close valuation at stock exchange prices (without regard to the immediate profits assessed to tax, £29.2 m., and with no regard to the much higher replacement costs, and the capital value of £1,100 m.). I take the mean valuation of April, 1927, and March, 1928, and find it to be £860 m.

"Interest on War Securities not taxed by deduction at the	
source .....	£96 m.
Interest under Schedule C .....	151 ,,
	-----
Total .....	£247 ,,

I have computed the capital value of this interest at the several market prices obtaining in 1927-8 for the different stocks shown in the official abstract, and reach a total of £4,866 m.  $\pm$  40.

Dominion and Foreign Securities and possessions. Interest £83.9 m., similarly give a capital value on sample prices of £1,290 m.  $\pm$  100. (The total of our foreign investments is of course quite different, much more being included under the main item of Profits.)

#### *Loss and Evasion.*

It is at this point we should consider also (1) Businesses making continuous recent losses; (2) Evasion.

(1) In *British Incomes* (Chap. VI) I dealt fully with the losses which were at that time not reflected in the average assessed profits, and the set-offs for them in the assessed profits which were not commercial profits. The net result was then that the gross assessments were 4 per cent. in excess of commercial profit, after taking the losing businesses into account. (There is also valuable official information as to the proportion of losses for recent years, in the Colwyn Committee's report and Appendix.) Dr. Coates' official tables showed the *turnover* resulting in a loss (on the average of a good and a bad year) as 8 per cent of the total. Now if, in capitalization we deal only with the businesses making profits, we appear at first sight to ignore the tangible asset value of losing businesses, including land, buildings, investments, plant, debts, etc., which in the aggregate must be considerable. But in this connection we must remember (a) that the land, buildings and investments are already covered by our valuation elsewhere; (b) that the Stock Exchange rate of valuation in the share market always allows for a risk of loss—for the rate of interest demanded tends to vary with the riskiness of the class of business—and that generally a great deal of actual specific loss is pooled, by insurance, throughout business (*vide* my article on "Taxation, Risk-taking and the Price Level," *Economic Journal*, 1928); (c) our Stock Exchange multiplier is therefore lower than it would be if there were no losses in business, but this tends to be compensated by the fact that our aggregate of assessed profit is higher than it would be if we took account of all losses and deducted them first, before capitalization. The compensation is, however, in my judgment not complete, and I believe that the rate of interest tends to be influenced downwards more by future prospects of profit in promising business than upwards by bygone experiences of losses, especially in staple industries. This is a mere psychological judgment. But I am disposed to make a small net addition for the value of unassessed assets of declining or moribund businesses, not covered by the net effect of the two factors of capitalization. (2) So far as evasion is concerned, all the evidence (*e.g.* the Royal Commission on Income Tax, 1920) has been that it became much worse after the war, but the administrative machine has been so much strengthened now to deal with it, that I doubt if it can possibly exceed 15 per cent. over the area in which it can reasonably exist. Now this area is much smaller than is generally supposed and lies mainly in the field where over capitalization is lowest. For the vast mass of profits assessed on large companies with audited accounts it can be ignored. It may be taken that the area of the capitalization to which it applies is not more than one-fifth.

An allowance of 5 per cent. for both these factors is in my judgment ample.

Our valuation for this section of the national capital has now become, therefore :—

(a) General profits	...	...	£8,675 m. $\pm$ 635
(b) Railways	...	...	860 m. —
(c) Interest on War Securities	...		4,866 m. $\pm$ 40
(d) Dominion and foreign Securities	...		1,290 m. $\pm$ 100
Special Allowance on (a) and (d)	...		475 m. $\pm$ 100

£16,166 m.  $\pm$  875

*The Income of the Non-Income-tax-paying Classes* derived from capital was taken in 1914 as a capital value of £200 m.  $\pm$  50. It must be remembered that in taking all the gross figures in the foregoing estimates we have covered most of the *forms* of investment and savings, and this item is a residual for such things as the stock of *very* small traders, tools, etc. I refer here to Chapter III of the *National Income*, 1924 (Bowley and Stamp), and to the fact that the numbers in this class, owing to the change in the value of money between 1914 and 1928, are much smaller, the effective exemption limit £150 now being represented by less than £100 then. An estimate of £100 m. capital is the best guess I can suggest, but at this point the national savings certificates should be included, making £475 m. in all.

*Furniture, Motor-cars, Works of Art*, etc. (movable property yielding no income). Vide *British Incomes*, p. 400. Estimates based on : (1) the former estimates, increased for population and price level, (2) a ratio to house values, (3) the estate duty valuations and (4) fire insurance, leads me to think the capital will lie between £1,300 m. and £1,700 m., and I take £1,500  $\pm$  200 m.

In the previous estimate there was an item, "Foreign investments not brought into charge." But the *legal* charge now covers income arising abroad but not remitted, and only the question of general evasion—of income tax, not sur-tax—arises.

*Government and Local Property*.—This was put by Giffen at £400 m. for 1878 and £500 m. in 1888; by the *Economist* at £630 m. in 1909, and by Money at £450 m. *net* (after deducting the national debt and local loans) in a detailed survey. But both Giffen and Money made double entries when they included profit-making concerns (gasworks, waterworks, etc.) in public ownership. In *British Incomes* I dealt with the road problem, and showed that a large part of public expenditure serving specific properties must be taken as valued in the valuation of those properties. Such con-

sideration as I have been up to the present able to give to this section leads me to a figure of £900 m.  $\pm$  300 (but see also Appendix II).

*Deductions from the Gross Capital Values.*—(a) The capital value of profits and interest included in the foregoing but owned by persons abroad. This is estimated at £500 m.  $\pm$  150 (*vide* the *National Income*, 1924, p. 46).

(b) Charges to be paid ultimately out of taxation upon the profits capitalized in the foregoing. The total national debt at March 1928 was £7,631 m., including £1,095 m. external debt, of which £952 m. is the total of the United States loans, which we can regard (as at March 1928) as equated by the reparation settlement with Germany. This makes a net £6,679 m. The sums due to us from Dominions and Allies are £2,066 m., including Russia £887 m., or net £1,179 m. These are in relief of our debt £1,179 m., leaving £5,500 m.

(c) Similar charges which are counted as individual wealth in the hands of the recipients above, but which have to be discharged out of local rates. The local debt is approximately £900 m. This makes £6,400 m. in all ( $\pm$  200 m.). There is room for discussion, with a nice balance of argument, whether these valuations should not also be made on a present price basis, and not a face value basis, inasmuch as a large part has been included as wealth on the latter basis in the gross figures. There is also room for examination whether some of this is not held abroad, and included in the deduction already made, which would increase the net estimate. Or alternatively whether sufficient allowance has been made for total capital including war debt owned abroad.

Summary of Detailed Estimates.					Statistical Approximation.	
			m. £.		+	—
Real property—Buildings ...	...	...	4,500		300	200
Land ...	...	...	950		75	75
Farmers' Capital ...	...	...	450		40	40
Profits and Interest ...	...	...	16,170		875	875
Profits below Income-tax level ...	...	...	475		50	50
Furniture and movable property ...	...	...	1,500		100	300
Government and local property ...	...	...	900		300	100
			24,945		1,740	1,640
Less belonging to people abroad ...	...	...	500		150	150
Gross wealth ...	...	...	24,445		1,890	1,790
Deduct Debt charges ...	...	...	6,400		200	200
Net wealth ...	...	...	18,045		2,090	1,990
					say $\frac{1}{3}$ rds	
					$\pm$ 1,350	

Accepting the fact that both concepts, gross and net, have their usefulness, which has claim to priority as our chief and general reference when we refer to National Wealth? A simple test will give the answer. If a man stints consumption and saves £1,000 it finds its way into a new factory, building or other item in the inventory, and the result is that both gross and net are increased by £1,000. If the State compels him to save by taking his £1,000 as tax, and pays B, a war-loan holder, £1,000 off his loan, then B has to invest it in some new asset, and the appropriate item in the inventory goes up £1,000, but the Interest item goes down £1,000, and the gross figure is *unmoved*. But the debt charge is reduced £1,000, and so the net wealth goes up £1,000. Obviously then the net wealth is sensitive to *all* saving additions, and the gross is not.

*Comparison with Valuation by the Estate Multiplier.*—In comparing these figures with any estimate arrived at by the multiplier, we have to deduct from the £24,445 m.—(a) The evasion allowance and unrevealed values, say £1,050 m. (b) The capital value of charity and corporate properties not coming into the estate duties. The sum “caught” in the Income Tax assessments is £38 m., and from this and the Corporation duty, I imagine that the capital value not coming into estate duty would approach £1,000 m. (c) The entry for Government and local property £900 m. These total to £2,950 m., and reduce the gross figure to £21,495 m.  $\pm 1,350$ , which includes Northern Ireland, approximately in the ratio 22,076 : 231, and thus the total for Great Britain is about £21,275 m., which falls to be compared with the rough figure of £20,050 m. given on page 5. A detailed examination of the possible reasons for this difference is, of course, beyond the limits of this address, but inadequate deduction for War Loan held abroad would be the most likely one for a part of it.

*General Conclusions.*—I have not attempted to check the estimate by the inventory method which is so useful in the United States, because the material with us covers so small a part of the whole field.

I think it may be conceded to me that I have not been lacking in boldness in making this attempt. But inasmuch as we have, up to the present, relied upon mere modifications and additions to my original structure of 1914, it may well be urged that, upon rebuilding being necessary, it is “up to me” first of all to attempt it. Certainly I have lived with the subject in its various aspects for a good many years—it was perhaps the earliest upon which I took an active part in this Society—and the need for an inaugural address seemed to remove the last excuse that I could put forward for not dealing with it. This initial effort is therefore on the broadest lines, and many of the details cry out for particular research. I

shall be glad to receive further detailed information, criticism or suggestions, especially before printing in the *Journal*, but I have found in the process of going over first approximations for further refinements, that these tend to offset each other, and there is a curious stability about the large totals.

My purpose has been forward-looking rather than retrospective comparison. We may indeed try to allow for the change in price levels since 1914 and the off-setting change in interest, and then deduct 4 per cent. for the figures of the Irish Free State no longer included. It is possible to say broadly that the position is not inconsistent with our having spent all our new savings for five years on war, having sold over a quarter of our original foreign investments, and having saved in the eight post-war years 1920–27 at the generally estimated rate of £475 m. per annum. [*E.g.* : (£14,310 m. — 600 — 1,000)  $\times \frac{3\frac{1}{2}}{5} \times \frac{160}{100} + 475 \times 8 = £18,035$  m.]. It is, however, consistent with other possible components also.

But I am much more concerned to begin afresh with a technique suitable for comparisons in future years, and that is why I have given most of my space to the new questions which have arisen in dealing with this problem. It will be for some other time and some other person to deal with the many features, including distribution and the “multiplier,” which I have left untouched.

## APPENDIX I.

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## APPENDIX II.

## THE EFFECT OF PUBLIC EXPENDITURE, AND OF PUBLIC BORROWINGS, UPON NON-PUBLIC VALUES.

(1) If a man restricts consumption and saves £100, he may buy a piano, or put central heating in his house, or a bacon-cutting machine in his shop, or acquire a founder's share in a club. But instead of this, with his neighbours he may build a concert hall, or light the streets, or put up a public market and abattoir, or a municipal golf links or town hall. In the first group, the piano is a new wealth-entity, retaining its independent value because it is transportable to any market and not dependent for its preservation as wealth on having raised the value of the house in which it stands. But the concert hall depends, for keeping its own value, upon the same community owning it, and it has no transferable market value, but the amenity may add a little to the values of all the houses in the town, and, therefore, taking into the valuation its "object value" at cost, and also those added values or "influence" values, gives too high a total result. The central heating adds, *pro tanto*, to the value of the house in which it is put; it has no separate value whatever. Probably in the same way, all the houses are worth more to sell by reason of the street-lighting expenditure, and to count it separately is to duplicate values seriously. The bacon-cutting machine increases the selling value of the business, and it is probable that the public market for auction has some reflex influence on the businesses that can use it, possibly to the full extent. The private expenditure on a club-house retains its value as wealth almost entirely at the club, and influences the value of the residences very little. Similarly, the value of a town hall is unlikely to be fully reflected in the enhanced values of the general property, though a golf links may well be. One may consider that, if an estate is laid out with such amenities, the loss on the site value of land not utilized and the actual outlay may both be made good to the proprietors by the added property values. It will be seen, therefore, that property values and business values may reflect anything, from a very slight proportion up to the whole, of the communal investment cost, so that the addition of the actual cost of the asset itself tends to make gross aggregate values of private and public property, taken together, more than the absolute truth. The extent of their "influence values" depends upon time and custom. When communal expenditure represents not merely amenities, but positive necessities, which are much more cheaply supplied by common than by individual action, then the absence of such expenditure



(drains, good road approaches) may *subtract* far more from general property and business values in the aggregate than the cost of them. There should be the greatest hesitation, therefore, in adding in to the total separately the cost or even scrap values of old-time and thoroughly assimilated communal necessities. The cost of a beautiful monument, or a finer town hall, is probably never reflected in other general values. But it is a lasting object of civil pride and pleasure and as much entitled to count in national wealth as a statuette in your hall. An object of art does not forfeit its right to count in the total merely because it is in public ownership instead of private.

(2) Let us now introduce the factor of borrowed money. The individual, instead of saving for himself, gets a loan from a distant relative. This makes no difference whatever to the object valued, or to its influence on other correlated values. Nor does it introduce any other items into the account. For the valuation is an objective one, and this loan really divides the ownership of the valuation between two people. Debts and loans as such are not separately valued. But if the money was borrowed from an uncle in Australia, then a British asset has come into existence without any British saving, and an item has to be added to the deduction for capital in Britain owned abroad, thus in effect cancelling the specific addition of the object value but not cancelling the influence values.

But if the town borrows money, the public loan created will figure in the assets of the individual lenders, in addition to any object value and any influence values, but under our method it should be deducted from the gross total as a communal debt, and thus give the same result as the above. When the individual borrower saves and pays his British creditor, no figures whatever in the valuation are changed unless the creditor creates a new asset with the repayment. Then the gross total rises. If he repays his Australian relative, no valuation of assets changes, but the gross total alters because of the reduced deduction. When the public borrower pays off, the gross total remains *exactly the same*, for some new asset comes in, and the loan holding disappears, but the net total rises because public debt is reduced.

(3) The situation in (2) is modified slightly where repayment is made gradually over a period of years because the existence of the liability means compulsory saving through taxes and rates, which may, by psychology, depress "influence values" more than the influence of the object or asset raises them. In the case of very wise and tangible communal expenditure this is unlikely. Moreover, the additions to "influence values" represent a capitalization of effects for, say, eighteen or twenty years, whereas the liability to

repayment, which is a subtraction from "influence values," is spread over perhaps forty.

But past expenditure on war may have hardly any plus "influence value" (that kind of security being different from police or legal security), and there is nothing objective in the assets. There is the loan asset (being the value of certain income in the hands of individuals, or forming part of profits), and this swells the gross total, but it is cancelled by the deduction in getting at the net. The whole debt, however, does not necessarily depress influence values by the full amount, for it might be paid annually wholly out of wages through a consumption tax.

(4) The conclusion is that our method of dealing with communal expenditure tends to swell the gross totals unduly by an unknown amount, and our treatment of communal debt tends to reduce the relative net total unduly, but whether one influence completely offsets the other so that the *absolute net* is unduly high or low is quite indeterminate. But an absolute determination is not of great moment for most purposes. With a constant method, comparability is in no way affected by these doubtful points in method.

#### PROCEEDINGS OF THE MEETING.

MR. FLUX: I hope I may be allowed to say a word or two in expression of the feeling with which I have received this Medal at the hands of the President. Sir Josiah has referred in flattering terms to myself and to my work. There were no hands from which I could have taken the Medal with greater pleasure than those of the President. I shall treasure the Medal as a mark of regard from a group of men with whom I have worked for many years in close association, and it makes the award the more precious that it comes from men with whom I have had a long connection; the expression of their opinion has for me a very much higher value for that reason. While I feel humble at being put into so small a group of so distinguished men, I feel at the same time flattered and honoured by being considered worthy of joining that group. The Society has conferred upon me the greatest distinction that they could confer upon anybody in electing me as President, and I shall carry the memory of the two years in which I served in that office as a most pleasant memory for the rest of my life. The Medal will be a visible sign of what has happened, although I shall not need a reminder of that kind. I wish to express my thanks to the Council, and for the approval expressed by Fellows present of the act that the Council has thought right to do in their name.

May I now venture in the name of the Society to offer you, Mr. President, our very cordial welcome to the Chair. We

want to take this opportunity of expressing the satisfaction with which we welcome your acceptance of your election as President, and that is a satisfaction that is no less felt over the choice of subject for your Presidential Address. Those of us who have followed the work connected with the valuation of the national capital know that in no hands could the examination of the difficult problems associated with that valuation at the present time be trusted more safely than in yours. The long connection that you have had with the development of the subject ensured that for us; the great variety of experience which you can command in comparison with most of us who are humble students of statistics, ensures that your treatment of the difficult points will be inspired by a knowledge that is rare among statisticians. We therefore welcome your selection of this subject, and we shall regard the contribution you have made in your address to-night as a reference document of the highest value.

It is a highly valued privilege of a retiring President that, by tradition, he is invited to propose the vote of thanks to the incoming President on the reading of his Inaugural Address. I do not propose to abuse the privilege by swaying from the standard of abstention from criticism which tradition has also sanctified in this Society, but I should like to say how much enjoyable memories have been stirred in considering the matter that you have put before us. Memories of earlier discussions in this field have been refreshed—discussions in which the temerity of youth had to suffer some burning of fingers. You referred to a volume in which you expressed your opinions on many details connected with the problem handled to-night, a volume in which, incidentally, you took opportunity to point out to some of us that in venturing into fields with which we were not familiar we needed an adequate guide. We were younger in those days, and we ventured rashly where now we might perhaps be disposed to go very carefully. On the whole I think that we were luckier than we deserved in the results that we obtained at that time. I am referring to the fact that it is not to-night for the first time that we meet and discuss in the Society estimates of national wealth. Following the invitation in your paper (p. 22) where you indicate the kind of subjects on which knowledge on this subject can throw helpful light and the value that estimates of the national wealth and income have in a community, one is tempted to look at one or more of the classes of problems there given, and there are remarkable results from such an examination. Take, for example, the valuation of the national wealth in 1914. I do not think it would be possible to place the national income in 1914—I presume we are dealing with circumstances before the war—at a higher total than £2,300 million; therefore we have something like six and a half times the national income represented in the national capital of £14,319 million at that date. What have we to-day? £18,000 million of national capital, with a national income somewhere in the neighbourhood of £4,000 million, practically four and a half times the national income expressed in national capital. Measuring the national capital in that way, it appears to have decreased remark-

ably, and reflections upon what may be the significance of that will, I think, occupy some of our minds seriously in the weeks that are to follow as we meditate over the material placed in our hands to-night.

With other similar comparisons I shall not attempt to deal to-night. The distribution of the national wealth according to the ages of its holders is one of the very interesting fields, and I imagine we shall not be surprised if we find that the national wealth is found in the hands of the older members of the community in no less degree than before the war. That is a pure guess.

You have dealt, in building up the figure of the national wealth, with the embodiment of that wealth in different forms, and there again there are things which are interesting and significant. In dealing with manufacture and distribution, you bring out the capitalized value of the assessed profits as £5,700 million. In comparing that with the figures which were given in the final report on the first Census of Production, it seems to me that this represents a larger fraction of the total wealth to-day than it did then. It is true that the figures are not directly comparable, but I have done my best to make such comparisons as are possible, inasmuch as the figure estimated then was a figure dealing with manufacturing industry, and a figure covering distributive industry is not found in the place to which I have referred. I have, however, tried to estimate whether this element of the national wealth takes a larger, smaller or the same place as it did then, and it appears to me to take a larger place, and that has an important significance.

These are some of the first points that occurred to me as I read through the paper and, as it were, laid down in my mind the outstanding points, the reasons why I was grateful to have now what I have been waiting for for a considerable time, grateful to you for having been persuaded to undertake the task of making, if only under the name of "provisional study," a study of the position, giving us the advantage of your wide experience with all the technicalities involved. In that feeling I am sure I am joined by all those who have had any earlier contact with the problem, and we have here an assembly not lacking in students of the subject.

With the greatest of confidence and the greatest of pleasure I move that the best thanks of the Society be given to our President, Sir Josiah Stamp, for the address that he has placed before us this evening, and I will ask Sir Bernard Mallet to be good enough to second this vote of thanks.

SIR BERNARD MALLET: The honour of seconding the vote of thanks to our new President falls to me presumably for two reasons. It is usual for former Presidents to be chosen for this duty, and I, unfortunately, owing to the recent losses which Sir Josiah Stamp has deplored in his address, happen to have now become the senior member of that small body.

In the second place, rather early in my Civil Service career I began to take an interest in questions of this kind whose importance was not so widely recognized then as it has since become. When I was a Commissioner of Inland Revenue thirty years ago I had the

opportunity of studying the material available there on questions of national income and capital, and did what I could in a humble way to improve our statistics, and to draw my own conclusions on questions like the distribution of income, taxable capacity, and so on—questions with which many able writers and officials have since familiarized the public. Not long after I had become a Fellow of this Society I gave my first address (in 1908) on a “Method of Estimating Capital Wealth from the Estate Duties,” and followed it up in 1915, with Mr. H. L. Strutt’s very able assistance, by a paper on the “Multiplier and Capital Wealth.” I well remember the mild excitement caused on the first occasion in statistical circles by the comparatively low total produced by my calculations, which caused Professor Bowley to exclaim that “somebody had robbed us of two thousand millions, and that the Society is now in full quest to find where that has gone to, or whether it ever existed.”

I am much interested to note from certain passages in this address that the attempt to reconcile the results obtained by what Sir Josiah calls the “Giffen or direct method” of capitalizing income, with those derived from the application of a multiplier to the estate duty statistics, is still in progress, and that he has gone far to bridge the differences, partly by pointing out the necessary limitations and qualifications of the use of the multiplier. But my own original object was to confine attention to the multiplier itself without much regard to the consequential questions arising from it, and to lay a foundation for future investigations. It is a satisfaction to me to feel that I was successful in both these objects, for the method suggested in these papers has been in the main accepted as sound, and the results have been a fruitful subject of controversy ever since. I have not followed them sufficiently to be able to comment in detail, as Mr. Flux invited me to do, on the distribution of capital according to age groups.

Sir Josiah Stamp’s appeal for “detailed information, criticism or suggestions” before the printing of his address in the *Journal* makes one regret, as one often does, the custom of the Society that a Presidential Address should not be discussed or criticized as other papers are, but I am glad to be precluded from making a critical examination of the figures and arguments in the address, if only for the reason that I have had the paper in my hands for too short a time to make such a task possible. My old friend, the late Sir Alfred Bateman, on the occasion when he and I moved the vote of thanks to Sir Herbert Samuel, told us that he had once annoyed a President and been severely hauled over the coals for having called attention to what he thought a “serious statistical blunder” in a Presidential Address! It would ill become me to attempt such an act of *lèse-majesté* in the case of so eminent a statistician and economist as our new President, even if I were capable of detecting a “serious blunder” in what he has placed before us. I should certainly come off second best in any such encounter with him. But I may perhaps just hint that, while full of admiration for the comprehensive and convincing manner in which he has developed his estimates on the Giffen method, I still retain a sneaking paternal

fondness for the method of estimating capital wealth from statistics of capital, a method of which Sir Josiah Stamp's criticisms have done a good deal to increase the validity.

Even the shortest space of time, however, is enough to enable us to feel sure of the importance of this fresh handling of the question of the national income, which will be accepted, like his previous contributions to the subject, as a work of unquestioned authority.

Sir Josiah Stamp has very modestly expressed his appreciation of the honour conferred on him by his election as President. We shall all feel, I am sure, that it is he who has done honour to us by accepting an office for which he has been pre-eminently marked out for many years. If he were not what we know him to be, a glutton for work, and one with an unrivalled capacity for turning rapidly from one subject to another, and treating all with the hand of a master, we should marvel that so busy a man should have made time for this new responsibility—for the office of President of the Society is no mere sinecure. I have the greatest pleasure in seconding the vote of thanks to a President whose election will do much to increase the prestige and authority of the Royal Statistical Society.

The vote of thanks to the President for his address was formally put to the meeting and carried unanimously.

SIR JOSIAH STAMP, replying, said: Thank you very much for that vote of thanks. I always understood and, I thought, apprehended quite deeply the value of the tradition which excludes a discussion of a Presidential Address, but I never felt its inwardness so satisfactorily as I do to-night. I do not think for a moment that I shall escape criticism, and I hope not. I have found that however much one may escape for the moment with the Society, there is always a reckoning later on, because I have never examined any subject before the Society in detail in an entirely non-controversial context, but what I have had subsequently to go into the witness box at some Royal Commission and deal with those very figures, when they have become the subject of public attention—particularly relating to cotton, steel and coal, on which I have had to give evidence on figures given in papers to the Society. War wealth, capital levy, and national savings are things which have come up from time to time and focussed the public gaze and been intently looked at by Royal Commissions, so that some time or other I know I shall have to suffer the reckoning, even if I have escaped it now. There will, however, I hope, develop from discussions such as Mr. Flux has indicated many fruitful deliberations.

One point Mr. Flux has put to me. The estimate, either here or on any previous occasion by the direct method, does not enable us to see how much the funds are derived from abroad. The figures we capitalize are in three parts:—

1. The part which is clearly identifiable as coming from abroad.
2. The part of which the Inland Revenue now endeavours to give us a broad view by saying, "These are the profits of concerns mainly engaged in trading abroad."

3. The part which they say they cannot identify, where the profits from abroad are so entangled with home activities as to make identification impossible.

It is impossible from income tax figures or this particular method of capitalization to say what is exactly the income from abroad.

I thank you very much for your kind reception of my address.

As a result of the ballot taken during the meeting, the candidates named below were elected Fellows of the Society :—

William Harry Brenton Carey,	George Penn Titterton Kirkham.
B.Sc.	Edwin W. Kopf (re-election).
Stanley Clark.	Edwin Kay Landless.
George W. Daniels.	Arthur MacCallum.
William Henry Escott.	Sydney Barnett Mackenzie Potter.
Frank Healey.	Charles Alan Robinson.
William Edward Hill.	William Thomas Russell.
Horace Francis Hughes.	Oliver M. W. Sprague.
John Foster Humphreys, A.I.S.A.	W. N. Srivasachari.

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## STATISTICS OF TOTALISATOR BETTING.

By A. P. L. GORDON.

[Read before the Royal Statistical Society, December 16, 1930,  
the President, Sir JOSIAH STAMP, G.B.E., in the Chair.]

1. *Competitive Position of the Totalisator.*

SINCE the Totalisator began operations in 1929, no aspect of its performance has been more discussed than the return made to winning backers. Many considerations, both of speed and of convenience, must have some bearing on future developments; but the odds paid form the most direct point of competition. The Racecourse Betting Control Board, in its first annual report, gives comparative statistics under this head. The comparison is based upon a £1 stake (win and place) upon each winner, and shows an advantage of some 45 per cent. in favour of the Totalisator. It by no means follows that the Totalisator is uniformly the more profitable form of betting. Bookmakers' quotations against outside chances are almost invariably nominal; when these chances are successful, the Totalisator often beats the book by a wide margin. The form of comparison adopted by the Control Board gives full, perhaps undue, weight to these occasions. The Totalisator may well pay odds of 30-1 against a starting price of 20-1; one such occasion would outweigh eighty on which the book paid 3-1 against the Totalisator's 23-8. Yet the volume of betting in the latter case would be far more substantial, and a greater number of backers would be impressed with the superiority of the bookmakers.

The first object of this investigation is to ascertain the true comparative position. For this purpose a sample was taken from the flat-racing records of 1930. The figures refer to the results of 1,060 races decided between the opening of the season and the St. Leger meeting. Nine races were dead heats, the results of which were discarded; on one race the Totalisator and the bookmakers paid on different horses; one occasion, on which a dead heat was run off, was included. There were, therefore, 1,051 effective decisions; of these :



The Totalisator paid the better odds on	...	...	639 occasions.
Bookmakers*	"	"	355 "
Equal odds were paid on	...	...	57 "
			1,051

The Totalisator has, on balance, a real advantage: if no regard be had to the winner's price, the chance of a Totalisator dividend at least as good as the starting price is one in 1·510.

The next enquiry relates to the persistence of this advantage at different dividends. It may be argued that, since the Totalisator is markedly superior for backing outsiders, some compensating disadvantage may be expected at the other end of the scale. For this purpose the data were arrayed in order of the size of dividends, and the whole divided into four groups as near as possible to the Quartiles; in each of these groups a similar comparison was made between the two sets of prices. The results were as follows:

*Comparison of Totalisator and Bookmakers' Odds in Dividend Ranges Defined by the Quartiles.*

Group.	Dividend Range.	Number of Races.	Percentage of Occasions† on which Totalisator made the better return.
I.	2s. 3d.—5s. 3d.	260	49·1 per cent.
II.	5s. 6d.—9s.	264	57·2 "
III.	9s. 3d.—17s. 6d.	266	64·3 "
IV.	17s. 9d. and upwards	261	83·1 "

† Counting equality of odds as half a point.

This table establishes a relation between the Totalisator dividend and the chance of returning a better price than the bookmaker. The precision, or otherwise, of this relation will be considered at a later stage; at present it is sufficient to note that it exists. At either end of the scale the relationship is most pronounced: of the races won at dividends of 2s. 6d. or less,† the Totalisator beat the book on only 27·9 per cent.; in the range above the ninth decile (dividends of 35s. 3d. and upwards) the Totalisator scored on 95·4 per cent. of the occasions.

\* Throughout this paper, Bookmakers' prices are the officially published Starting Prices, which represent the odds quoted in the ring at the moment of the Off-signal.

† The Totalisator dividend includes the stake money, and represents the return on a wager of two shillings. Thus a dividend of 2s. 6d. corresponds with a book price of one to four: 4s. represents even money, 12s. odds of 5-1, and so on.

The advantage over bookmakers' prices is seen to be far from constant: while the Totalisator is the better form of investment where outsiders are concerned, there is a distinct tendency in the bookmakers' favour for the backing of popular chances. It is usual to ascribe this to a quality which, in bookmakers, is described as sporting; a popular victory is said to be "bad for bookmakers," and the inference is that the professional interest is habitually a layer of, and therefore a loser on, the more fancied horses. I do not propose, at this stage, to venture comment upon this opinion; but there is another, and in my contention more important, cause of the Totalisator's diminished advantage in the low dividend ranges.

All Totalisator betting is conducted in units of two shillings. From the total pool a fixed deduction of 6 per cent.\* is made; the balance is distributed among the holders of winning tickets.† On the surface, therefore, the Totalisator would seem to be impartial; its profits are not, in theory, affected by the popularity of the winner.

In practice this is not the case. Dividends are declared in the form of the return made on unit stake; in computing the dividend, fractions of threepence are ignored. Thus, if the dividend worked out at 10s. 2·9d., a sum of 10s. (4-1) would be declared: a backer who had wagered £10 on the winner would thus receive £50, instead of £51 4s. 2d. to which, on a full distribution, he would be entitled. The retention of fractions by the Totalisator is justified on the ground of convenience, since the handling of large sums in copper would retard the process of distribution. But it is insufficiently recognized that this practice has a far more serious effect upon the competitive position at low dividends than at high.

The sequence of dividends is discontinuous; a given dividend corresponds, not with a single number (or proportion) of winning tickets, but with a finite range of proportions. Over and above the determined deduction of 6 per cent., the Totalisator has an expectation of profit from fractions. This amounts to a sum less than threepence, multiplied by the number of winning tickets. It is obvious that, the greater the number of winning tickets, the greater will be the expectation of profit from fractions; and this condition is identical with that defined by the lowness of the dividend. The Totalisator, therefore, tends to make its biggest profits from races won by popular chances.

\* Six per cent. on Win and Place pools at meetings under Jockey Club rules; 10 per cent. on double event pools; 10 per cent. at meetings under National Hunt rules and at Point-to-Point meetings.

† In this paper, for the sake of brevity, Win betting only is considered. What is here said of Win betting may be applied, *mutatis mutandis*, to the Place pools.

A numerical example will make this clear. From a pool of 10,000 units (of 2s. each), a sum of £940 is available for distribution. A dividend of 2s. 3d. will be paid on any number of winning tickets from 7,521 to 8,355: the total amount distributed will lie, therefore, between £846 2s. 3d. and £939 18s. 9d. Arguing in the same way, we see that the distribution on a dividend of 20s. lies between £929 and £940. Thus at dividend 2s. 3d. profits may be as high as 15.4 per cent.; at dividend 20s. they cannot be greater than 7.1 per cent.: the lower limit is, of course, 6 per cent. in both cases.

If we assume an even distribution of winning percentages, the expected profit is the amount retained when the number of winning tickets is midway between the highest and lowest number on which the given dividend will be paid. Thus at dividend 2s. 3d. the expected number of tickets is 7,938, which defines an expectation of profit amounting to 10.7 per cent. On this basis the expectation of profit (per cent.) at dividend  $\frac{m}{4}$  shillings is given by:

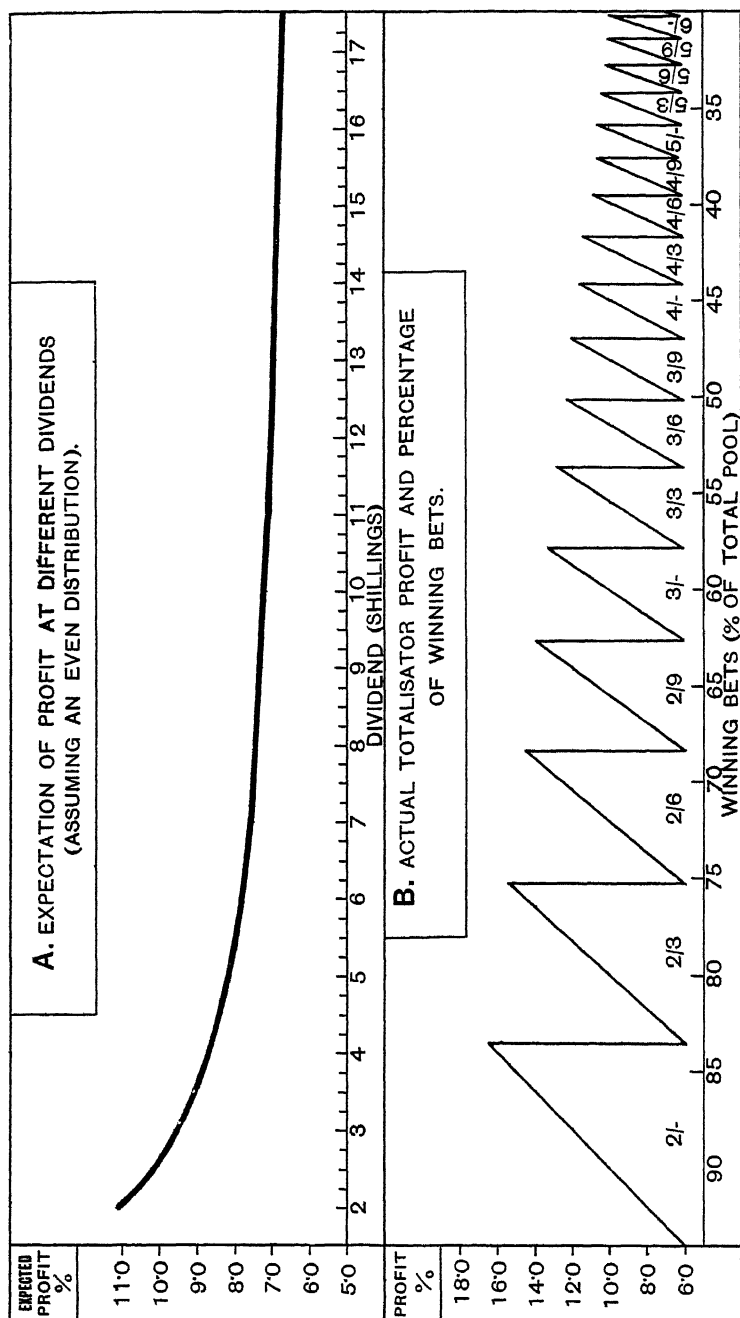
$$P = 6 + \frac{47}{m+1} \dots \dots \dots (1)$$

which gives the values, at different dividends, shown in Graph 1 (a).

The continuity of this curve is fictitious; there are no non-integral values of  $m$  in relation (1), and no dividends intermediate between the threepences. If the actual profit be related to the percentage of the pool staked on the winner, we have the discontinuous line shown in Graph 1 (b). It will be noticed, in passing, that not only does the profit range decrease as the dividend rises, but also that the range of percentages covered by a single dividend decreases very rapidly.

The conclusion to be drawn at this stage needs explicit statement. The Totalisator is a worse form of betting on favourites than on outsiders; this may or may not be due to the fact that book-makers lay the well-backed horses; but it is certainly due, at least in part, to the fact that the Totalisator is itself a backer. It backs the more supported chances, not through any conscious wagering, but through an arrangement which permits the expectation of profit to vary inversely with the dividend.

From the Control Board's standpoint this is poor business. The *raison d'être* of the Totalisator is to produce surplus profit, out of which it is hoped to improve racing conditions. The realisation of this surplus depends upon the turnover, which can only reach a high figure if this form of betting is made increasingly attractive. The backer who bets habitually in large sums of money is seldom a supporter of outside chances; the fact of his support influences the horse's position in the market. Backers of this



GRAPH 1.

type are accustomed, when they win, to obtaining better odds from bookmakers than from the Totalisator; this is due, not to any inherent defect, but to the fact that they see the Totalisator at its worst.

The distribution of Totalisator betting according to size, in 1929, was as follows :

2s. tickets ... ..	£205,673	38.50 per cent.
£1 tickets ... ..	227,044	42.49 „
Higher denominations ... ..	17,475	3.27 „
Bankers' chits ... ..	83,939	15.71 „
Miscellaneous * ... ..	150	0.03 „
	<hr/> £534,281	<hr/> 100.00

There is no sure means of judging whether these figures are typical of the actual distribution of course betting. Offhand, it would seem that the proportion of big money, including bankers' chits, is unduly small. If this is the case, as I suspect, there can be only one explanation: big sums are being withheld from the Totalisator on account of the poor odds paid on the kind of chance which big money normally supports. Whatever may be the reason, the turnover is, as yet, small. It has been calculated, though I cannot tell with what accuracy, that an effective surplus could be returned on an average daily turnover of £20,000. This figure has only been exceeded on certain rare and popular occasions; yet it represents no more than one-seventh of the volume of money betted, according to the experience of the Betting Duty, on the course.

It may be remarked, in passing, that though the Totalisator can only accept bets on the course, it is able to deal with away money blown to the course by Starting Price offices. The leading bookmakers allow their clients to choose between starting prices and Totalisator odds; bets made under the latter conditions are normally laid off with the Totalisator through an agency which has a telephone on the course. There is no reason why, if the Totalisator odds are attractive, this form of business should not be substantial; the volume of away betting is at least as great as that transacted on the course; and, given a consistent record of good odds, competitive causes would increasingly divert this business to the Totalisator. The potential throughput of the Totalisator is, therefore, by no means confined to the bets of backers who attend the course in person: one-seventh of the course betting is a smaller figure, in relation to the sums available, than would at first appear.

\* Unaccounted for in the distribution quoted by the Racecourse Betting Control Board in the Report and Accounts for 1929. The 10s. tickets were first introduced in 1930.

In the light of these considerations the actual turnover would seem unduly small; and there is good reason for believing that this is due to the withholding of the larger business. The position can be remedied, to some extent, by the creation of new betting, as has recently been attempted in the daily double. There is a limit to this policy; ultimately the turnover can only be increased through direct competition. This involves an improvement of the odds paid on popular chances: the next section of this paper will consist of an examination of various means by which this end could be achieved.

## 2. *Improving the Low Dividends.*

(a) *Distribution of Fractions.*—The first, and most obvious, method of improvement consists in the declaration of dividends at closer intervals than the established threepence. This method has the disadvantage of entailing the use of large sums in copper money: against this, the Control Board states, there are objections. I propose to assume that these objections are real and insuperable.

A variation of this method is the declaration of dividends to, possibly, two decimal places of a penny, and the payment to winners to the nearest threepence below the sum represented by the number of tickets presented. Thus, if the calculated dividend were 2s. 8·897*d.*, the amount declared would be 2s. 8·89*d.*: in this case:

Holder of	1 ticket	who now draws	2s. 6 <i>d.</i>	would draw	2s. 6 <i>d.</i>
„	2 tickets	„	5 <i>s.</i>	„	5 <i>s.</i> 3 <i>d.</i>
„	5	„	12 <i>s.</i> 6 <i>d.</i>	„	13 <i>s.</i> 6 <i>d.</i>
„	10	„	25 <i>s.</i>	„	27 <i>s.</i> 3 <i>d.</i>
„	100	„	250 <i>s.</i>	„	274 <i>s.</i>

Thus, although the small backer would be receiving only 1 to 4, in terms of bookmakers' quotations, the ten-pound backer would have odds of 1 to 2·703.

This system is open to objections. It would add greatly to the work of the paying-out cashiers; and, since the profit from fractions would depend, not only upon the amount of the dividend, but also upon the size-distribution of the betting, it would be extremely hard to budget for future receipts. From the betting standpoint, too, racing is a democratic sport; an arrangement tending to favour the big backer might well lead to a loss of popularity. I am, therefore, inclined to discard this system as both impracticable and undesirable. In what follows it will be assumed that dividends must be paid, as at present, to the nearest threepence below the calculated amount; it remains, therefore, to devise a satisfactory method of calculation.

(a) *A Fixed Profit-Range.*—An alternative method of calculation would be provided by the adoption of a rule to the following effect :

“ The determined percentage shall be varied in such a manner that the total profit, including fractions retained by the fund, shall if possible lie between 5 and 10 per cent. If this calculation permits of two dividends, that declared shall be the highest which will permit a total profit of  $7\frac{1}{2}$  per cent.”

The objection to such a rule is the difficulty of framing it in a way which covers all possible cases; and, even if this were achieved, the occasions of real improvement in the dividend would be few. For example, the present range covering a dividend of 2s. 3d. is from 75·2 per cent. to 83·5 per cent. of the total pool. The maximum proportion permitting a distribution of 2s. 6d. would, under the system envisaged, be raised from 75·2 to 76·0 per cent. This is scarcely a significant improvement. A further objection arises when it is seen that, if there were 77·0 per cent. of winning tickets, a distribution of 2s. 3d. would yield a total profit of  $13\frac{3}{4}$  per cent., and a distribution of 2s. 6d. a profit of  $3\frac{3}{4}$  per cent.; thus the rule would not apply, and an additional clause would be needed to give the Totalisator the benefit of every doubt.

I do not wish to waste time in a detailed consideration of this suggestion. It would involve laborious Control-room calculations which, under the pressure of racecourse conditions, might easily go astray. It is difficult to understand, and it would contribute little to the purpose for which it was made.

(c) *A Fixed Expectation of Profit.*—During the period covered by the first accounts, the sums retained out of pools amounted to £40,681, or rather more than  $7\frac{1}{2}$  per cent. of the amount invested. The report states that the retention of fractions renders it possible to obtain a desired return with a correspondingly lower percentage deduction: this principle being consciously envisaged, I propose to assume that the total profit aimed at is  $7\frac{1}{2}$  per cent. The calculations which follow can be readily adapted to conform to any other desired return.

The suggestion here is that the Control Board should fix, not the minimum profit (as is done at present), but the expectation of profit. The elaborate safety of the present system introduces, virtually, a gambling element. Persistent failure on the part of well-backed horses would inevitably diminish the Totalisator's profit; the persistent success of the same chances, by giving competitive advantage to the bookmakers, could only lead to a loss of business. This dilemma is the inescapable outcome of the fixed minimum; the

precautions taken to safeguard the finances of the Totalisator create a position which is not really safe at all.

Under the revised system here envisaged, the fixed factor is the expectation. The method of calculation will permit, as do the present rules, a statement that a given dividend will be paid when the proportion of winning tickets lies between certain limits. But these limits will be so chosen that, when a number of races have been won at that dividend, the aggregate profit will be  $7\frac{1}{2}$  per cent. of the combined pools. This expectation will be the same, irrespective of the dividend: thus, at dividend 100s. the possible profit might lie between 7·4 and 7·6; at dividend 2s. 3d. it might lie between 3 per cent. and 12 per cent.

This suggestion involves a general revision in our manner of thinking about the Totalisator. There will be no determined deduction, and none of the elaborate Control-room calculations which, I understand, cause the delay between the hoisting of the blue flag and the announcement of the dividend. The calculations are, indeed, intricate and laborious; but they would be performed in the peace of the laboratory rather than under the stress of race-course conditions. Their effect would be to determine a scale of percentages, from which dividends could be read off at a glance. On the course it will be necessary, as now, to take the final read and make the amalgamation; but, after this, all that will be needed is a single division sum, expressing the number of winning tickets as a percentage of the pool. The Control-room official would then refer to a specially prepared table, giving the maximum percentages on which each specific dividend is paid.

I should like to anticipate one possible criticism. In all business activities the scientific offsetting of risk against risk is opposed on the ground that it is gambling. A case could, presumably, be made out for the assumption that Life Assurance companies undertake a gambling transaction in respect of every policy; but this does not keep their shares out of the trustee list. Under the suggested system, the profit will sometimes be very low; conceivably, on a given day, expenses may not be covered. It is equally possible, in the case of Life Assurance, for a selected life to be unexpectedly cut short; even the Casino at Monte Carlo may experience a lean evening. But, in the long run, the correct profit-level will be realised, provided the calculations are properly made, without any uncertainty whatsoever; and, in adopting such a system, the Totalisator will have taken the first step towards making an increased turnover possible.





$c'$  becomes unduly high in the low dividend ranges. The remedy proposed is to fix  $c'$  and to allow  $a$  and  $b'$  to be adjusted automatically. It is impossible to fix  $c$  absolutely, owing to the limitation which requires that  $m$  should be integral. If, however, the expectation  $c'$  is fixed, the actual profit will vary around this level: under the present system, on the other hand, the actual profit varies around a changing level, which rises as the dividend decreases, the lower limit of profits being 6 per cent.

Since we have assumed that 7·5 per cent. is the total profit to be aimed at, we may write:

$$c' = a + b' = 7\cdot5.$$

It can easily be shown that:

$$a = c' - \frac{100 - c'}{2m + 1},$$

and it follows that, under the assumptions mentioned:

$$a = 7\cdot5 - \frac{92\cdot5}{2m + 1} \quad \dots \quad (3)$$

Substituting for  $a$  in relation (2), we have:

$$\begin{aligned} p' &= 4 \frac{2m + 1}{m(m + 1)} \left( 100 - 7\cdot5 + \frac{92\cdot5}{2m + 1} \right) \\ &= \frac{740}{m} \quad \dots \quad (4) \end{aligned}$$

We are thus able to relate the dividend with the mean of the highest and lowest number of tickets upon which, in a given pool, the specified dividend will be paid.\* Thus, if the dividend is 2s. 3d., so that  $m = 9$ , we have  $p' = 82\cdot2$ . This means that a dividend of 2s. 3d. will be paid over a range of percentages of which the mid-point is 82·2.

Now if we take  $p$  at its expectational value, we have:

$$a = \frac{11,100 - 85p}{1,480 + p}.$$

And hence it is seen that a dividend of  $\frac{m}{8}$  units will be paid if:

$$p > \frac{1480}{2m + 1} \text{ and } p < \frac{1480(m + 1)}{m(2m + 1)}.$$

\* The same result can be reached, more simply, directly from the fact that, at the expectational value of  $p$ , the total distribution is 92·5 per cent. of the total pool.

It will be seen that these limits do not form a continuous series; for, if we write  $m + 1$  for  $m$  we find an upper limit for dividend  $\frac{m+1}{8}$  units at :

$$p = 1480 \cdot \frac{m+2}{(m+1)(2m+3)} \neq \frac{1480}{2m+1}.$$

Thus the lower limit of winning tickets at dividend  $\frac{m}{8}$  units is slightly higher than the upper limit at dividend  $\frac{m+1}{8}$  units; this is due to the fact that  $a$  changes between the limiting values of  $p$  : the discrepancy is small, amounting only to the difference between :

$$\frac{1480(m+2)}{2m^2+5m+2} \text{ and } \frac{1480(m+2)}{2m^2+5m+3},$$

and may, for present purposes, be neglected. Rather than introduce at this stage a further complication, I prefer to note the necessity for adjustment, and give the Totalisator the benefit of the doubt. I therefore regard the percentage ranges as defined by the upper limits :

$$p = \frac{1480(m+1)}{m(2m+1)} \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad (5)$$

This is the more profitable for the Totalisator, and therefore the less favourable to the purpose in hand.

It will be noted that the calculation of dividends by any variant of this method has, at least, the merit of simplicity. All that is necessary is to express the number of winning tickets as a percentage of the total pool :  $m$  is then given by the integral part of its value in the relation :

$$m = \frac{1480}{p} \cdot \frac{740+p}{1480+p}$$

which can be easily set out in tabular form, the dividend being read off at a glance. In this way the Control-room calculations could be shortened and simplified, while the dividends paid on low-priced chances could be sensibly improved.

The best comparison of dividend payments under the actual and the proposed system, taking the latter in the simplified form already described, is afforded by the upper limits of winning percentages at which different dividends would be paid. With reference to the corrected calculations, an elaborate comparison is made later in the paper : a brief summary, with reference to the Mean-basis as described above, is provided by the following table.

*Comparison of Dividend Calculations.*

Maximum Number of Winning Tickets, in a Pool of 10,000 units, upon which the Totalisator would pay the dividends specified.

Dividend.		Corresponding odds.	Maximum number of Winning Tickets.	
			As now paid.	Suggested revision (Mean Basis)
s.	d.			
2	3	1-8	8,355	8,654
2	6	1-4	7,520	7,752
2	9	3-8	6,836	7,019
3	0	1-2	6,266	6,413
3	3	5-8	5,784	5,903
3	6	3-4	5,370	5,467
3	9	7-8	5,013	5,092
4	0	evens	4,700	4,765
4	3	9-8	4,423	4,477
5	0	3-2	3,760	3,790
5	3	13-8	3,580	3,605
6	0	2-1	3,133	3,146
6	3	17-8	3,008	3,017
7	0	5-2	2,685	2,689
7	3	21-8	2,593	2,594
7	6	11-4	2,506	2,507
7	9	23-8	2,425	2,424
8	0	3-1	2,350	2,348
8	3	25-8	2,278	2,275
9	0	7-2	2,088	2,083
9	3	29-8	2,032	2,026
10	0	4-1	1,880	1,872
10	3	33-8	1,834	1,826

There are as many possible proportions of winning tickets as there are tickets in the total pool. In 55.77 per cent. of these the dividend paid is, under the system used by the Control Board, equivalent to even money or less. If the system described, which is the least favourable form of the theoretical system envisaged, were used as the basis of calculation, the chance of an improvement in the dividend paid on any odds-on or even money chance is one in 3.293. The range in which dividends would be improved includes 75.75 per cent. of the possible proportions.

The actual distribution of proportions, defined by the frequency of different dividends, differs substantially from the distribution of possible proportions. The range of possible improvement covers 441 cases in the sample analysed (or 41.9 per cent.). But it covers 56.8 per cent. of the occasions upon which the bookmakers returned

odds at least as good as the Totalisator, and is therefore the section upon which attention should be concentrated. Moreover, in the higher ranges the dividend is often very greatly in excess of the starting price: in these cases the Totalisator can well afford to sacrifice some small portion of its advantage. Under the system outlined above, a dividend of 97s. 9d. would be declared on a race on which the present dividend would be 100s.: this would not appreciably affect the chance of returning better odds than the book-makers. It is in the low ranges, where the odd threepence makes a big difference to the total, that it is important to secure an improvement: it seems probable that the improvement attained would be only partly offset by a corresponding deterioration in the higher ranges.

It will be noticed that the system described above does not entirely remedy the observed tendency towards a higher expectation of profit at low dividends. This is due to the fact that no allowance was made for the interim change in the value of  $a$ . A great part of the discrepancy is, however, removed; at dividend 2s. 3d. the expected profit is 7.716 per cent., and at 10s. it is 7.650 per cent.: under the Control Board's system these figures are 10.7 per cent. and 7.146 per cent.

Up to this point the argument has been simple enough: it has been concerned merely with showing how the theoretical mechanism of the Totalisator might be adjusted so as to be equally fair to the backers of all types of chance. It remains to be seen whether the process can be carried to a conclusion. It has been assumed, too, that the proportion of winning tickets is evenly spread between zero and 100 per cent.; the calculations require rectification in the light of the frequency-data. This will be attempted in the next section.

### 3. *Corrected Basis for Dividend Calculations.*

At this point the paper ceases to be a recital of facts and enters the analytical stage. I have endeavoured to avoid an overburden of mathematics in an argument intended to be suggestive, rather than descriptive, of executive action. It is, however, necessary to evolve a mathematical basis by which dividends can be made to fulfil the conditions envisaged; these are that, dividends being payable in multiples of threepence, the expectation of profit shall be equal to 7.5 per cent. for each dividend. From the executive standpoint the most practical device is to tabulate the upper limits, expressed as a percentage, of each dividend range: the somewhat laborious calculations of the Totalisator Control-room would then be reduced to a single simple division.

Our initial assumption was that the expectational proportion of winning tickets lay midway between the upper and lower limits. This assumption is contradicted by the very conception of frequency; if dividends are declared more often at 2s. 9d. than at 2s. 6d., then, of the dividends declared at 2s. 6d. (which lie between that figure and 2s. 9d.) the expectational value lies nearer to the higher dividend than to the lower. The first step, therefore, is to fit a frequency curve to the observed data regarding the dividends paid.

The following table gives, in summary form, the frequency of different dividends within the sample :

*Frequency Distribution of Totalisator Dividends.*

Dividend Range.	Frequency.	Dividend Range.	Frequency.
2s. 3d.-3s.	67	24s. 3d.-25s.	11
3s. 3d.-4s.	84	25s. 3d.-26s.	10
4s. 3d.-5s.	90	26s. 3d.-27s.	10
5s. 3d.-6s.	84	27s. 3d.-28s.	3
6s. 3d.-7s.	73	28s. 3d.-29s.	9
7s. 3d.-8s.	74	29s. 3d.-30s.	7
8s. 3d.-9s.	52	30s. 3d.-31s.	6
9s. 3d.-10s.	51	31s. 3d.-32s.	2
10s. 3d.-11s.	48		
11s. 3d.-12s.	38	32s. 3d.-36s.	30
12s. 3d.-13s.	31	36s. 3d.-40s.	17
13s. 3d.-14s.	19		
14s. 3d.-15s.	29	40s. 3d.-50s.	20
15s. 3d.-16s.	20	50s. 3d.-60s.	20
16s. 3d.-17s.	16	60s. 3d.-70s.	11
17s. 3d.-18s.	20	70s. 3d.-80s.	8
18s. 3d.-19s.	12	80s. 3d.-90s.	10
19s. 3d.-20s.	11	90s. 3d.-100s.	4
20s. 3d.-21s.	8	Over 100s.	12
21s. 3d.-22s.	12		
22s. 3d.-23s.	13	Total ... ..	1,051
23s. 3d.-24s.	9		

It will be seen that the sample was not large enough to permit the use of single dividend ranges as group-units; the data were consequently rearranged in one shilling groups, the first containing all occasions when the declared dividend was 2s. 3d., 2s. 6d., 2s. 9d. or 3s.; since this group includes all dividends which were calculated at over 3s. and up to (but not including) 3s. 3d., the mid-point is clearly 2s. 9d.

The lowest dividend paid was 2s. 3d. (eleven occasions), and the highest 49s. 6d. The most superficial examination of the data shows that any curve, to present a true picture, must be without an upper limit. The distribution is markedly skew, rising to a mode early in its course, falling away less rapidly, and continuing for an indefinite distance along the horizontal axis, to which it is asymptotic.

These considerations point to the form (Type III) :

$$y = y_0 e^{-\gamma x} \left(1 + \frac{x}{\alpha}\right)^{\gamma\alpha}$$

as being the most probable form of the curve.

At the outset of the calculations it became clear that the high dividends disproportionately affected the value of the moments. There could be no frequency intermediate between zero and one; and the effect of long successions of zero frequencies followed by a frequency of one at a high dividend was to swamp the values of the third and fourth moments in the lower ranges. Further, what has been said about the purpose of the investigation will serve to show that we are interested rather in the slope of the curve in general, and in the lower ranges in particular, than in the total area defined by integration to infinity. The shape of the curve at low dividends is of predominant importance, since in this section the range of percentages covered by a single dividend varies very rapidly. It was therefore considered advisable to obtain the best attainable fit in this range rather than to strive after embarrassing completeness, only to be had at the price of distorting the curve at its crucial points. It would be tilting at windmills to attempt, in the face of these circumstances, to fit a curve to the complete data; accordingly, the dividend range was taken up to 32s. declared (odds of 15-1), which includes 919 of the total population of 1,051.\*

Proceeding on this basis, the moments, after making Sheppard's adjustments, were determined as follows :—

$$\begin{aligned}\mu_2 &= 45.94343 \\ \mu_3 &= 381.4617 \\ \mu_4 &= 8,014.094\end{aligned}$$

referred to the mean, 10.214635 shillings. These give :

$$\begin{aligned}\beta_1 &= 1.500485 \\ \beta_2 &= 3.796711 \\ \lambda &= -0.557689\end{aligned}$$

\* It may be pointed out that a fairly important group, in the 30s.-40s. range, is excluded from the calculations. This group is quite an important characteristic of the distribution, though it is hardly definite enough to allow the presumption that it is indeed a second mode: it may equally well be the result of sampling error. Moreover, in this section each dividend covers a relatively small range of percentages, and the slope of the curve is therefore the less important. The important thing was to obtain a good fit in the low ranges: since the fit was improved by the exclusion of this group, this argument was considered to over-ride those which might be urged to the contrary.

This is rather disappointing. Theoretically, the correct form is Type  $J_I$ ,

$$y = y_0 \frac{\left(1 + \frac{z}{\alpha_1}\right)^{m_1}}{\left(1 - \frac{z}{\alpha_2}\right)^{m_2}}$$

which is a curve limited in both directions. The constants were found to leave a considerable range of observations outside the limits of the curve; and this fact, for present purposes, more emphatically invalidates the method than would a bad fit. There can be no manner of doubt that Type III is the curve ultimately required; the badness of the fit may be attributed to the smallness of the sample, and a possible heterogeneity which is mentioned later. It was therefore considered preferable to fit a curve of this type. The calculations gave :

$$\begin{aligned} y_0 &= 64.86669 \\ \gamma &= 0.241436 \\ \alpha &= 6.97581 \\ q &= \gamma\alpha \\ &= 1.68034 \end{aligned}$$

and the curve becomes :

$$y = 64.87e^{-0.241z} \left(1 + \frac{z}{6.976}\right)^{1.680}$$

with the origin at the mode, which is at dividend 6.06321 shillings. The curve is limited in one direction, at  $-0.91260$  shillings.

It will be seen from Graph II that the fit is very far from perfect; its saving characteristic is that the mode is approximately in the right place. This condition being granted, the curve can be used for present purposes, which are, after all, illustrative rather than executive. It would perhaps be desirable to extend the sample and obtain a closer fit: the use of the curve obtained will give better results than the rough method already quoted; it will not wholly remove the disparity of expectation, which will be slightly too high below the mode and slightly too low above it; but it will go some way further towards achieving this.

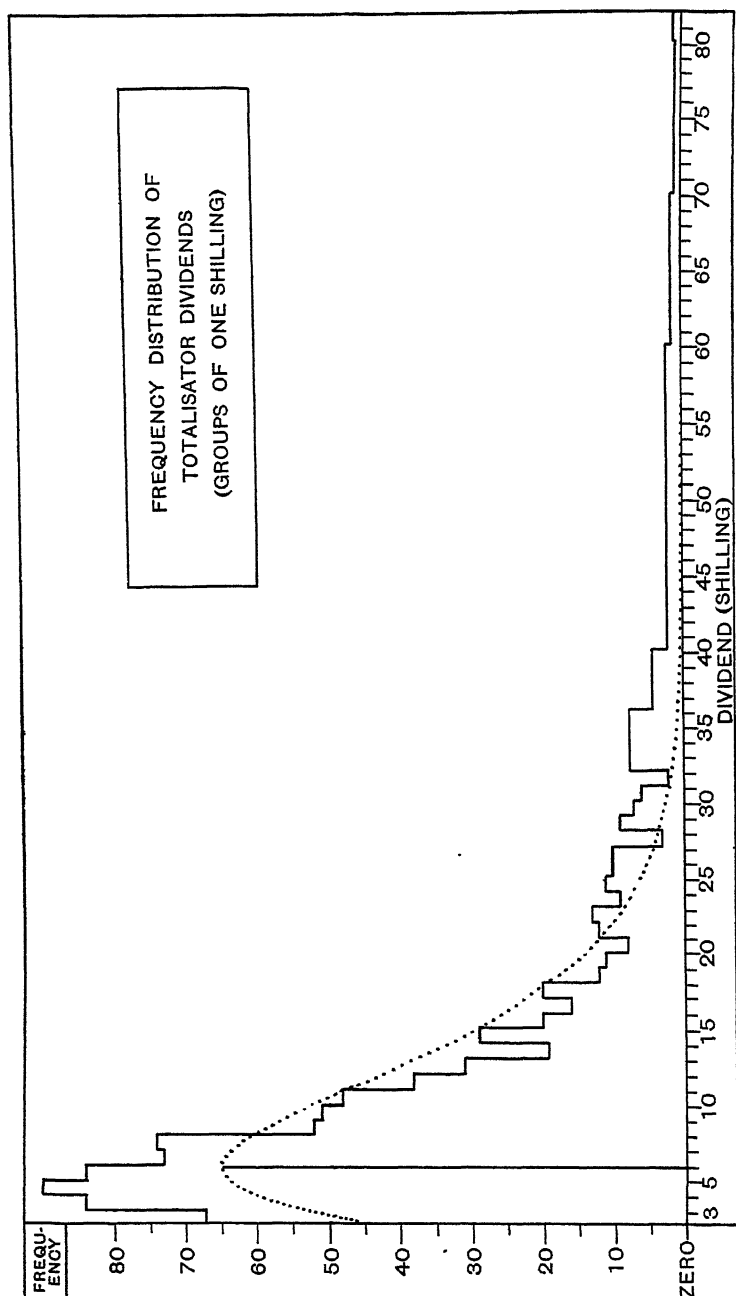
The total area under the curve :

$$y = y_0 e^{-\gamma z} \left(1 + \frac{z}{\alpha}\right)^{\gamma\alpha}$$

is given by :

$$\int_{-\alpha}^{\infty} y \cdot dz = \frac{\alpha y_0}{q^{q+1}} \Gamma(q+1)$$





GRAPH 2.

Similarly, the area up to the point  $z = v$  is given by :

$$\begin{aligned}\int_{-a}^v y \cdot dz &= \frac{ay_0 \epsilon^q}{q^{q+1}} \cdot \Gamma(q+1) \text{ where } r = (\gamma\alpha + \gamma v) \\ &= \frac{ay_0 \epsilon^q}{q^{q+1}} \cdot \Gamma(q+1) \cdot I\left(\frac{\gamma\alpha + \gamma v}{\sqrt{q+1}}, q\right)\end{aligned}$$

And hence the area from  $z = v_1$  to  $z = v_2$  is found from :

$$\int_{v_1}^{v_2} y \cdot dz = \frac{ay_0 \epsilon^q \Gamma(q+1)}{q^{q+1}} \left[ I\left(\frac{\gamma\alpha + \gamma v_2}{\sqrt{q+1}}, q\right) - I\left(\frac{\gamma\alpha + \gamma v_1}{\sqrt{q+1}}, q\right) \right].$$

Now the frequency curve exhibits a continuous series of dividends and, being properly centred, may be taken as showing the frequency of dividends actually calculated, rather than declared, under the Control Board system. The problem is to find a series of limiting percentages,  $p_1, p_2, p_3$ , etc., so that a dividend of  $\frac{m_1}{4}$  shillings can be paid from  $p_1$  to  $p_2$ , a dividend of  $\frac{m_2}{4} \left( = \frac{m_1 + 1}{4} \right)$  from  $p_2$  to  $p_3$ , and so on; and so that the expectational value of  $p$  between  $p_1$  and  $p_2$  is given by  $p'_1$ , which gives a total distribution of 92.5 per cent.

The value of  $p'_n$  is given by the relation :

$$p'_n = \frac{740}{m_n}$$

which can be readily determined. Further, it is seen that  $p$  per cent. of winning tickets corresponds with a calculated dividend, under the Control Board system, of  $\frac{188}{p}$  shillings; which, in its turn, is represented by the relation  $z = \frac{188}{p} - M$  (where  $M$  is the mode), since the curve has its origin at the mode.

The expectational relation means simply that the area under the curve, between the limiting values of  $z$  defined by  $p_1$  and  $p_2$ , is bisected at the value defined by the (known) value of  $p'$ . Since the constants are the same throughout, this relation can be expressed by means of Gamma-functions :

$$2I(\omega', q) = I(\omega_2, q) + I(\omega_1, q) \quad . \quad . \quad . \quad (7)$$

$$\text{where } \omega = \frac{\gamma\alpha + \gamma\left(\frac{188}{p} - M\right)}{\sqrt{q+1}}$$

The argument  $\omega$  is the adjusted form of the value shown on the curve (*i.e.* the dividend as calculated under the Control Board system), corresponding with any given value of  $p$ : it is within these limits that it is necessary to integrate.\* The formula giving the value of  $\omega$  reduces, on substitution, to :

$$\omega = \frac{26.70971}{p} + 0.04403.$$

We are now able to express the limiting values of  $p$ , at each dividend, in terms of the expectational values. The relation, however, provides no means to an absolute determination, since the number of unknowns always exceeds by one the number of equations taken. It is therefore necessary to obtain a starting-point.

In practice this necessity gave rise to no small difficulty, owing to the great amount of interpolation necessary in solving for  $\omega_2$  in equation (7). It is clear, however, that if we take the mean of two expectational values as defining the upper limit which lies between them, we shall obtain a value of the corresponding lower limit which is numerically too low. The nearer the mean of the expectational values approaches the true limit, the closer will be the approximation afforded by integration to the next limit. The value given in this way will always lie on the side of the true limit remote from the mean of the next pair of expectational values. Thus, by taking the mean of the two values of  $p_2$  given by: (a) taking the mean of  $p'_1$ , and  $p'_2$ , and (b) solving equation (7) for  $\omega_2$  (and hence for  $p_2$ ), after putting :

$$p_1 = \frac{1}{2}(p'_0 + p'_1)$$

we have a first approximation, the errors in which are non-cumulative. The approximation can be repeated until any desired degree of accuracy is attained; this is likely to be a laborious process owing, not only to the approximations themselves, but also to the high degree of accuracy which would be needed in computing values of the Gamma-function. In the table which follows, the approximation was made once only; the figures given are analogous to those shown in an earlier table, and represent the greatest number of winning tickets on which the specified dividends could be paid.

It will be seen that the improvement in the low ranges is very substantial. For the odds-on or even money hazards, the chance of securing a better dividend by this system is approximately one in 2.71.

\* A procedure more simply envisaged would be to substitute for  $z$  in terms of  $p$  in the equation of the curve: this, however, yields a function incapable of integration with respect to  $p$ .

*Comparison of Dividend Calculations.*

Maximum number of Winning Tickets in a pool of 10,000 units, upon which the Totalisator would pay the dividends specified.

Dividend.	Corresponding Odds.	Maximum number of Winning Tickets.	
		As now paid.	Suggested Revision (corrected basis).
2s. 3d.	1-8	8,355	8,796
2s. 6d.	1-4	7,520	7,790
2s. 9d.	3-8	6,836	7,105
3s.	1-2	6,266	6,435
3s. 3d.	5-8	5,784	5,920
3s. 6d.	3-4	5,370	5,485
3s. 9d.	7-8	5,013	5,098
4s.	evens	4,700	4,775
4s. 3d.	9-8	4,423	4,477
5s. 3d.	13-8	3,580	3,610
6s. 3d.	17-8	3,008	3,017
7s. 3d.	21-8	2,593	2,597

The improvement of the low dividends is important for four reasons :

1. It is, as has been shown, in these ranges that the Totalisator is in its worst competitive position.
2. Big money tends to be invested in short-priced chances.
3. A greater number of actual backers are affected by the betting on these chances.
4. At low dividends the odd threepence, by which dividends might be improved, is a relatively large proportion of the total.

The last point adds especial significance to the improvement secured in the lowest ranges. In the odds-on division a threepenny increment in the dividend would have turned the scale in favour of the Totalisator in the majority of cases. In the higher ranges of supported chances the discrepancy is often large : this is due in part to the diminished relative importance of the monetary unit, and in part to a modification of sampling error, introduced by the fact that the horse distribution of the Totalisator bets does not correspond with the rest of the course wagering. This anomaly can only be corrected by increasing the turnover ; ultimately, it is to be assumed, the distribution will approach identity, and the competitive position will depend upon whether Totalisator or bookmaker reserves the larger percentage for profit and expenses. For this reason, it is submitted, future policy should be designed to strengthen, rather

than to impair, the Totalisator's competitive capacity: it is better to attract custom by generous payment on popular hazards, than to repel it by raising the determined percentage.

The following table shows the occasions on which the Totalisator has made a better return than the bookmakers' starting price; the same data are plotted in Graph III.

*Comparison of Returns Made.*

Percentage of occasions on which the Totalisator has made a better return than the bookmakers' starting price.\*

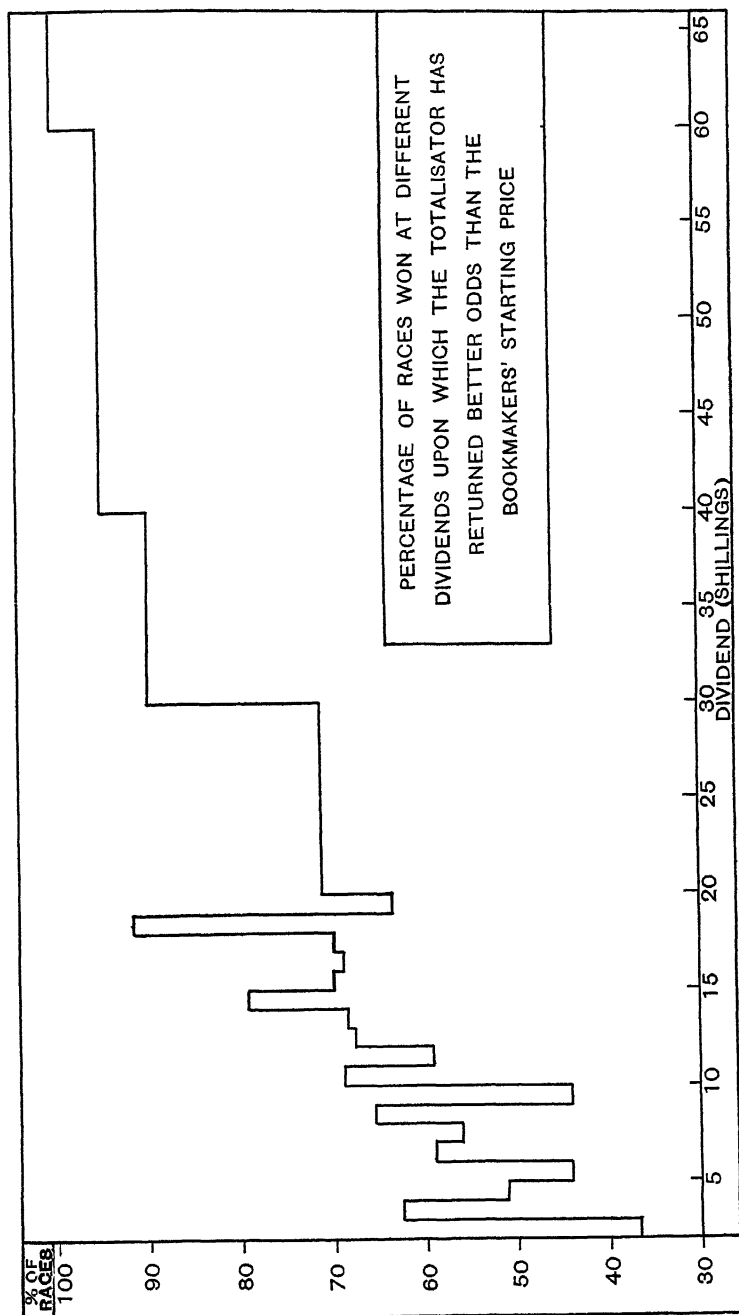
Dividend.	Percentage.	Dividend.	Percentage.
2s. 3d.—3s.	36.6	16s. 3d.—17s.	68.8
3s. 3d.—4s.	62.5	17s. 3d.—18s.	70.0
4s. 3d.—5s.	51.1	18s. 3d.—19s.	91.6
5s. 3d.—6s.	44.0	19s. 3d.—20s.	63.6
6s. 3d.—7s.	58.9		
7s. 3d.—8s.	56.1	20s. 3d.—30s.	71.2
8s. 3d.—9s.	65.4	30s. 3d.—40s.	90.0
9s. 3d.—10s.	44.1	40s. 3d.—50s.	95.0
10s. 3d.—11s.	68.8	50s. 3d.—60s.	95.0
11s. 3d.—12s.	59.2		
12s. 3d.—13s.	67.7	60s. 3d.—80s.	100.0
13s. 3d.—14s.	68.4	80s. 3d.—100s.	100.0
14s. 3d.—15s.	79.3		
15s. 3d.—16s.	70.0	Over 100s.	91.6

\* Counting equality of odds as half a point.

If there is any precision in this relation it is certainly not shown in the figures tabulated. In so far as these figures define a curve, it would seem that the chances of bookmaker and Totalisator are equal in the neighbourhood of dividend 6s. (odds of 2-1); this appears, from Graph 1 (a) to define a rate of profit of about 8 per cent.

I do not know how the expenses of bookmakers compare with those of the Totalisator. The latter carries substantial overheads, and turns over, at present, a relatively small volume of money. It is of interest to note that the Select Committee on the Betting Duty came to the conclusion that the net profit of bookmakers is about 1 per cent. of the amounts wagered. If 8 per cent. is a fair figure for the gross profit, it would seem that the expenses of bookmaking amount to some 7 per cent. of the turnover. On a basis of 7½ per cent. expectation, the Totalisator must either improve greatly upon the bookmakers' ratio of expenditure, or expand its turnover to a large extent, if it is to become a substantial factor in the diversion of betting revenue to the support of racing.

The irregularity of Graph III is suggestive. It is more than possible that another variable may be acting, and that this may



GRAPH 3.

have some bearing on the competitive position. I suspect that this factor is the number of runners. In a field of, say, twenty runners the normal chance of success is 19-1 against: this, less a deduction for bookmakers' profit, would be the price of each horse if the race were perfectly open. A horse starting at 4-1 in a field of twenty is a far better fancied candidate than he would be if he started at the same price in a field of eight. This consideration does not affect the Totalisator's expectation of profit; but it materially affects the range of prices at which bookmakers may be expected to be taking chances on their book. This, too, may account for the failure of the frequency-curve, on an admittedly small sample, to take the form which, from practical considerations, was to be expected. There is here a large field for investigation, to attempt which would be to trespass too far upon the Society's time.

It may well be found, when the matter is fully investigated, that the deduction should properly be determined, not by the percentage of winning tickets, but by the ratio which this percentage bears to normal (*i.e.* a hundred, divided by the number of runners). This problem may be approached from several angles, and its investigation may well throw some light upon the question of dividend calculation. In the meantime, it is submitted, the basis of calculation outlined in this paper is a substantial improvement upon current practice.

The Totalisator was legalised in order that it might serve a public purpose which has not yet been achieved. For this reason I offer no apology for having ventured to suggest a policy which will remove the gambling element from the Totalisator's composition, and give even the backers of favourites the beginning of a run for their money. It is far more logical to fix the expectation of profit than the minimum; indeed, it is the first principle of every form of business in which chance is offset against chance. At present the Totalisator has scarcely nibbled the edge of the market: if it is to secure a commanding position, it must enter into direct and active competition with the bookmakers. Sensational dividends on outside chances are of little value except as publicity; their very magnitude is a measure of their factual unimportance. The change of policy advocated in this paper will make the Totalisator a serious factor in the betting, on chances of the kind which secure the support of genuine backers; at the same time, it will simplify and shorten the Control-room calculations, thus helping to accelerate the declaration. In these circumstances, it is submitted, there is a strong case for revision along the lines suggested.

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## DISCUSSION ON MR. GORDON'S PAPER.

SIR JOSIAH STAMP: Mr. Gordon has been brief, and has left all the more time for the discussion of his paper and for questions to be put to him not merely upon the mathematics of the paper, but upon the elements of the subject with which it deals. I am quite sure that all the Fellows of the Society present are not familiar with the actual material which has been put through his mathematical mill. People interested in racing form one part of the community, and people interested in statistics form another part; a man may be included in both circles when they overlap, but whether this present company represents that coincident portion of both circles it is impossible for me to say. I do not think all statisticians are racing men, but whether all racing men are statisticians I do not know. I know the look of a statistician when I see him, but I have not all the stigmata of the racing man in my mind.

To those familiar with both aspects I am sure the paper will offer a number of points of interest. We do regard statistics as the hand-maid of all the sciences in that it can be applied to all classes of knowledge. Lord Kelvin said that we do not know anything about any subject until we can measure it, by which I take it that he meant until we apply statistics to it. Perhaps the reason why I know so little about racing is because I have never tried to measure it. Mr. Gordon has started me rather farther up in the class than I should have chosen myself, but that may not apply to all present.

I think we know statisticians when we see them, but if this present company is not made up of those people common to the two circles, but of two separate classes—racing men and statisticians—it may be interesting to each of them to see what the other looks like. I have in my possession a very interesting document containing the signatures of all the people who came to a Statistical Congress in 1860, when statistics were applied to different bodies of material, but had not yet reached the race-course. This interesting document is made all the more living to me by the letter from Disraeli's wife to Mrs. Bridges, which I have here, describing a crowded *salon* to which had been invited all these delegates to the Statistical Congress as "a body of men who for very hideousness the ladies declare were never equalled. I confess myself to a strange gathering of men with bald heads, and all wearing spectacles." I make this confession to all the racing people present who have not seen us before.

To come to more serious business, I now call upon Dr. Isserlis to propose the vote of thanks. We always welcome visitors to our meetings, and particularly invite them to take part in our discussions, and after the vote has been proposed and seconded the meeting will be open for general discussion.

DR. ISSERLIS: I consider it a great pleasure to have the opportunity of welcoming the reader of the paper—a reader who represents a very valuable addition to the Society in that he is the present leader of the Study Group, still a very young organization. Your opening



words, sir, have put me in a certain difficulty. There was a famous occasion on which Mr. Herbert Spencer, when playing billiards, was beaten by a younger man, and Spencer said that "such proficiency in what should be an elegant pastime argued a misspent youth." I am here to open the discussion on the paper presented by Mr. Gordon; if it turns out as a result of the discussion that one or other of us shows by his arguments that he is proficient in the matter, it may be argued that he shows signs of a misspent youth. My youth is behind me, but the reader of the paper will have time to improve. It is perhaps, therefore, not out of place to remind the Society that the science of probability owes a great deal of its development to games of chance, and not only to games of chance played by old ladies at the whist table. It was the pecuniary interests of gamblers with dice that set the science of mathematics on the ladder which finally enabled it to produce Laplace's *Théorie Analytique* and such things as the business forecasts published in the United States of America.

When we come to this paper, it does contain an illustration of the powers of mathematical statistics. Formulæ have been applied in a way which frequenters of the racecourse would hardly have expected, and could scarcely be expected to follow. I propose to deal with the paper by taking up certain points which to my mind require elucidation; it may be because of my lack of experience.

On p. 31, in the introduction to the subject, we have the statement:—"Bookmakers' quotations against outside chances are almost invariably nominal; when these chances are successful, the Totalisator often beats the book by a wide margin." After all, although favourites and well-backed horses do win, and often win unexpectedly, horses which are not well backed win more frequently. An analysis which I made in 1924 of the results of two thousand races held throughout the year, showed that in 60 per cent. of all the races the non-favourite won.

My next point concerns the same paragraph of the introduction, and the statement that "the volume of betting in the latter case would be far more substantial, and a greater number of backers would be impressed with the superiority of the bookmakers." (This is in reference to the occasions on which the Totalisator returns a higher dividend on an outsider's chance.) The table on p. 45 gives the frequency distribution of Totalisator dividends, and that table can be used to obtain a frequency distribution of sums invested. It can be deduced from that table that only 36 per cent. of the money invested by successful backers returns dividends of 4s. 3d. or less; that is to say, in that table, although the proportion of dividends of 4s. 3d. or less is fairly high, the corresponding amount of money invested is only 36 per cent. That being so, it is a reasonable thing for a greater number of backers to be impressed with Totalisator dividends because a greater number of backers are actually interested.

I now come to a point which affects the whole of the comparison in this paper, that between the Totalisator results and the bookmakers' odds. "Throughout this paper, bookmakers' prices are the officially published starting prices, which represent the odds quoted in the

ring at the moment of the off-signal." The bookmakers' odds are given as starting prices, but there is a market which may commence weeks before the race, which at any rate lasts for the finite time after one race ends and before the next race begins, and the odds recorded, starting prices, are the odds current at the end of the market—not when the market is finally made, but when the market is closed—and there is no information to be obtained except in the books of the bookmakers as to what is the average rate of odds at which the betting with the bookmakers is done. On the other hand, the Totalisator dividend is the same for every backer, so that the comparison is not a proper one. From this point onwards I am dealing with the theoretical problem that the author has set himself—the comparison of Totalisator results with the figures known as starting prices, which need not be the figures at which backers make the bulk of their bets. I do not know whether they are or are not.

I pass to the top of p. 33, and in that connection I am again referring to that misspent portion of my youth in which I analysed the results of the races in 1924. I then came definitely to the conclusion that for one reason or another bookmakers—who after all should not be gamblers, but merely people who keep the bets for backers—do not make a charge for the recording of bets made on favourites. The reason is probably a question of competition between one bookmaker and another, and there is yet another possibility of which I was reminded when reading an essay by you, sir, on "The Principles of Taxation"—that one of the soundest principles of taxation is that it should be placed where it can most easily be borne. There is no doubt that a backer who receives a return of 15 or 20-1, is not going to enquire very meticulously as to whether the fair mathematical odds should have been 18 or 23-1. It is therefore easier for bookmakers to get their gross revenue from outsiders rather than from favourites. If in 1924 a bet of one pound had been placed by the same backer on the favourite in every one of the two thousand races of the year, the backer would have been left pretty well where he was.

With regard to the footnote on p. 33, where Mr. Gordon says he has only considered the "win" betting, I take it that this refers only to the explanation of the way in which the betting is reported, and I assume the author does not maintain that the general results of his paper apply to "place" betting. As far as place betting is concerned, Totalisator results are generally admitted to be better than bookmakers' results.

There are other points which can very well be omitted for the moment, as I want to get on to the mathematical side of the paper. The author has made a good and sound point, which is this, that the Betting Control Board aimed at getting a 6 per cent. gross return, and have adopted an inexact and inconvenient method of doing it; they deduct the 6 per cent., and in distributing what is left of the money among those who backed the winner, they distribute not exactly to the nearest penny, threepence, or sixpence, as the case may be, but in threepences, always stopping at the threepence *below* the, correct answer, when this is not a multiple of threepence, so that, as

the author says, the profit of the Control Board is 6 per cent. plus fractions, and that leads to the inequalities, to some of which he has drawn attention, and the importance of which I suggest may be exaggerated, especially as we do not know what odds the bookmakers really do give.

There are two points in the mathematical treatment. First, the author has really had to smooth the figures represented by the frequency table on p. 45. I am not concerned for the moment with the question of whether he should have smoothed the frequency table of dividends or of numbers of 2s. tickets purchased—which are, of course, the reciprocals of the former figures, and would have involved a different mathematical problem,—but so far as smoothing these particular figures is concerned, the type of curve shown on p. 45 is not a happy type, and the author is aware of that himself. Although no test is given, I think it is quite clear from the figure that the attempt to fit a curve to a portion of the data has not proved a success. It is partly due to the author's decision to force a Type III curve on to the data after he had himself observed that the conditions were far from satisfactory, and that the criterion, which for Type III should be infinity, turned out to be  $-0.55$ . When that curve has been worked out, the problem of smoothing still remains unsolved, because the areas of the curve cannot be integrated, and because the starting-point of the curve cannot be fixed. The starting-point should not be in the range of 2s. 3d., but should of course be at 1s. 9d. If everyone who betted with the Totalisator backed the same horse, and if that horse won; if one thousand two-shilling units were in that way invested, only 940 would be returned; therefore the origin should be at 1s. 9d. and not in the range of 2s. to 2s. 3d. In the case of a curve limited at the left, the natural starting-point is absolutely fixed by that consideration, and that in itself would probably have helped to fit a better curve to the data.

I tried to see what would be the result of avoiding difficult mathematics altogether. If on p. 43 we take the third column, which is the maximum number of winning tickets as now paid, and prefix to that column two more figures, that is to say, start with a figure of 10,000 (which cannot occur because of the 6 per cent. dividend), and below it 9,700—if that is smoothed by the process of adding two consecutive numbers and dividing by 2, a series of figures will be obtained which, except that they are based on 6 per cent. instead of  $7\frac{1}{2}$  per cent., are almost proportional to the figures in Mr. Gordon's last column. Mr. Gordon's first figure is 8,796. The corresponding figure obtained by my method is on the  $7\frac{1}{2}$  per cent. basis 8,735, and other figures in the list are as follows:—

Mr. Gordon's figure.

My revised figure.

7,790

7,811

7,105

7,063

5,098

5,109

What is the meaning of the smoothing process I have indicated? It is simply this:—Mr. Gordon enumerates three choices; let the

Betting Control Board adopt a fourth choice. Let them say, "We will pay to the nearest 3*d*." That is all. When the dividend is 8*s*. 1*d*. they will pay 8*s*.; when 8*s*. 2*d*. they will pay 8*s*. 3*d*. In the long run I imagine the Law of Great Numbers will apply to this, and this ought to leave them with their 6 per cent. But they may prefer not to trust the Law of Great Numbers, and to adopt the 7½ per cent. basis instead of the 6 per cent., as a measure of loading when paying out to the nearest 3*d*. instead of to the nearest 3*d*. below, that would achieve the same result.

There is only one further point. Mr. Gordon quotes a Committee as having said that the net profit of bookmakers is probably 1 per cent. of the total turnover and that the gross profit might be assumed to be 8 per cent. I do not know what is his basis for that, but I asked my colleague this morning to examine the actual odds quoted by bookmakers at the races last Saturday. There were six races, and in each case, when the probability of winning of each horse as estimated by the bookmakers was expressed by a fraction, and all the fractions added, the total varied from 1·19 to 1·31. On an average the bookmakers loaded the odds by about 20 per cent. That is to say, if a bookmaker succeeded in making up his book properly, and had to pay out the same sum, whichever horse won—say £1,000—he would receive various amounts in respect of these horses and at the end of the day he would be left with about £200 or £300. I know nothing about the net profit. A failure to make up the book is partly a mark of inefficiency.

It has been a great pleasure to listen to Mr. Gordon's first paper, and if I have not been as complimentary about the details of the paper as I might, I do feel it is a very good attempt at applying statistical method to a subject which has not been sufficiently often treated before, and I look forward to getting a series of interesting and valuable papers from the author.

DR. RHODES: I have very great pleasure in seconding this vote of thanks to Mr. Gordon. I suppose some of us do occasionally indulge in betting on horse-racing with the idea of making money easily, and those of us who have been acquainted with the correlation calculus must have thought of going over past experience and treating the whole problem of making money by betting on horse-racing as a scientific study, analysing the results of races, finding out successful horses, what successes trainers and jockeys have had—treating the problem very scientifically and taking into account very many factors, in anticipation of finding that by working on such lines a man with a capital of one thousand pounds would probably be able to make his expenses year by year.

I gather from Dr. Isserlis that six years ago he was dallying with this, having analysed the whole of a year's racing, but on the only occasion when I ever did anything of this sort I did not succeed in my single bet; since then I have not worried about it any more. Until recently, to my mind the Totalisator meant some sort of horse-racing machine—a glorified roulette board, on which one put money at one end and received—or did not receive—it at the

other. Mr. Gordon's paper has proved very informative in that respect.

In addition to explaining the function of the Totalisator, the paper refers to the report of the Betting Control Board, and from that report I gleaned more information and discovered what a tic-tac man was, and I shall now be able to read the racing column in *The Times* with greater ease than before.

It was rather interesting to find from the paper the place which fractions have in the lives of the backers to-day, and if they realized how badly they were being done by those vulgar fractions to-day, they would have the same hatred towards them as they probably had in their school-days. Coming to the particular points which Mr. Gordon made, I agree that it would be better if the Betting Control Board instituted an average expectation of some particular percentage. He suggested  $7\frac{1}{2}$  per cent. for the purpose of argument, and in his endeavours to find out what sort of changes would be made, he referred to and used an experience of this last year. He used this experience merely in a tentative sort of way, but it was the only experience which he could reasonably refer to, and I think he probably made a mistake in bothering to fit a curve to that experience at all. I think he would have been quite comfortably satisfied if he had used, as a distribution of dividends, a series of straight lines or parabolas, instead of worrying about fitting a Type III curve. It certainly did not prove successful. Of course from his point of view he merely wanted to illustrate what sort of results would be achieved if the distribution of dividends were taken into account.

I do not think he is justified in asserting that the data suggest that the Type III curve is the only one which would suit the case; there are others of Pearson's types which have a finite starting-point, rise to a maximum and then taper off to infinity; and there are certainly many others, not of the Pearson type, which could be invented with these characteristics.

In order to find out what sort of significance there was in the figures on p. 51, to which Dr. Isserlis has referred once or twice, I have studied these figures rather closely. It will be seen that the suggested revision to the number of winning tickets shows figures in certain places which are quite considerably different from the figures as now paid. In a previous part of his paper (p. 42) he pointed out that the ranges of percentages of winning tickets at dividends of  $\frac{m}{8}$  units and  $\frac{m+1}{8}$  units do not merge at their limits when the percentage of tickets staked on the winner is evenly distributed. He points out, however, that the lower limit of winning tickets at dividend  $\frac{m}{8}$  units is only slightly higher than the upper limit at dividend  $\frac{m+1}{8}$  units. But there is not much difference between them, and as a matter of interest I worked out—assuming that there is a distribution of dividends unknown, taking no account of the distribution which Mr. Gordon quoted, but assuming the limits

he talks about are the same for different values of  $m$ —a table corresponding to that on p. 43. The interesting thing is that whereas he gets figures like 8,796, 7,790, 7,105, the figures I worked out were 8,387, 7,548, 6,862, and others of a similar nature. The point I would like to emphasize about these is that they are bigger than those in the table on p. 43, in the column headed "As now paid," but they are not much bigger. Thus by assuming an unknown distribution of dividends (not Type III), and assuming as true, what is approximately true, that the limits of ranges of winning percentages do merge, we get a series of figures very different from those Mr. Gordon worked out, and not very different from the series obtained as a result of the present procedure. Mr. Gordon's idea is, I think, reasonably sound, but I do not know that if it were put into operation it would be attended with the success suggested by the difference of the figures he gives and those as now paid. If you had a different distribution of dividends—and of course the distribution of dividends might be different next year from this year—the figures which he would then work out might have been considerably different from those which he did work out. But the difference between figures which he has got "As now paid" and his new figures might not always be as much as they are shown in this paper.

Apart from that I would like to add my words to those of Dr. Isserlis, and second this vote of thanks to Mr. Gordon for his very interesting paper, which I have certainly found most helpful.

SIR CLEMENT HINDLEY said he would like to congratulate the author of the paper most heartily and also to thank him. The way in which he had attacked the problem was extraordinarily interesting to those who were day by day connected with the work of the Totalisator, and for this reason he wished to thank the author as well as the Society for bringing the subject up for discussion in so learned an atmosphere. He felt that this had somewhat raised the status of the science on which he and his staff were engaged. It was a matter of considerable importance for the Racecourse Betting Control Board, for reasons which perhaps it was not necessary to go into on the present occasion, for it would no doubt be recognized that the whole of the Board's business was directed towards diverting an established business into its own tills. The Totalisator had come into a field already occupied, and the Board depended entirely upon the results of its efforts to divert the business already in existence.

Sir Clement feared he must plead guilty upon occasion of having used methods not entirely unknown to the President of the Royal Statistical Society and commonly called publicity. It was essential that certain aspects of Totalisator betting should be brought before the people engaged in the process on the race-course, and the particulars quoted from the Board's Annual Report were in the nature of publicity. It was shown in the report what would have happened if a man put £1 on every winning horse as compared with his efforts with bookmakers, but it was fully recognized that that was not a complete method of comparison. Sir Clement admitted that he had been struggling for some time with this particularly difficult problem

of comparing the results of the Totalisator and the bookmaker. The whole of the business depended upon being able to give the public something better when betting with the machine than with the bookmakers, and in the early part of the paper there was a particularly stimulating and interesting analysis, where the author had shown the comparison between actual returns of the Totalisator and the bookmakers arranged in dividend ranges defined by the "quartiles." Although he confessed that it was the first time he had ever heard of the quartile, it would be an addition to his vocabulary. He realized that here was some clue to a difficulty on which he and his staff had been working. The Board had been very glad to enable the author to have access to their figures and any information bearing on the subject.

This table presented an interesting picture from the practical point of view. It was shown that on a total of 1,051 occasions, on half the races the Totalisator had a better chance of beating the bookmakers than on the other half. This led one to examine at what point the advantage turned over to the bookmakers, and the author's argument carried on from that point. His method was a new one to Sir Clement, but it would be valuable for future analysis.

It would appear that the author had tied himself up rather unnecessarily with certain assumptions that he had made, and had thus made the subject rather more difficult. For instance, he had mentioned that dividends were paid to the nearest 3*d.* below the calculated dividend. That was a pure business convention; the value had been assessed when an attempt was being made to fix the percentage deduction to give the required revenue, and the conclusion was arrived at that if this were fixed at 6 per cent., by retaining the fractions the gross profit would amount to 7·7 per cent. Subject to certain practical difficulties, it would be quite possible to pay to the nearest penny, and that would remove a great many of the difficulties with which the author had tied himself up. It was very clearly realized that the Totalisator returns to the backer were not as a rule as good on the short-priced horses; generally speaking, it was on the very low dividends where the Totalisator prices fell down. The position would be much changed if one of two things were done; if they paid to the nearest penny there would be a difference in the comparison, or if they paid to the nearest 3*d.* either above or below, it would, for instance, largely increase the number of 2*s.* 6*d.* dividends as compared with the 2*s.* 3*d.* dividends paid at present.

The method suggested by the author was one which could never in practice be applied, however valuable as a scientific method. To attempt to explain to the public that they were being paid a particular dividend because it was printed on a particular table would lead to disaster. The only thing the public understood was very simple arithmetic, and it would never be possible to explain to them that there was a varying percentage deduction depending upon the proportion of winners to the total pool. There was also a limitation which was more serious, because the procedure was governed by an Act, and there was a clause relating to this percentage of profit which definitely prescribed the method of making the deduction.

Sir Clement said he would like to ask the author, who obviously made a habit of this kind of thing, if he would carry on his investigations, particularly on the lines of a suggestion which had been made. Supposing it were possible within the four corners of the law to make the percentage deduction from the losing stakes only, calculations showed that that would give much the same effect as that brought about by the author's method. Something worked out on these lines would be most valuable.

Dr. Isserlis had argued that it was not quite correct to compare the Totalisator prices with the starting prices published by the bookmakers in the published returns. It all depended upon the point of view. It was perfectly true that the bookmaker did quote other prices, and a series of prices, sometimes for weeks beforehand, and that the starting price as published was the final result of the competition in the market at the time the race was started. That was exactly what the Totalisator was, and from that point of view it was a perfectly fair comparison. If looked at from the point of view of the bookmakers' till and from the Totalisator till, it did not represent the same conditions, but so far as the racegoing public were concerned it was a perfectly fair comparison.

Sir Clement said he would not attempt to explain how the bookmaker made a book, but there seemed to be a certain amount of want of knowledge of this matter. The proposer had said that by working out the results of a certain race at Lingfield he could show that the bookmakers' gross profit was 20 per cent. If, however, a series of races were worked out, it would be found that the bookmakers' margin of advantage over the backer varied from about 3 per cent. to 80 per cent. in different races. That would take some time to explain, but it was important and affected the backer more than the bookmaker.

Sir Clement thanked the Society for the opportunity accorded to him to take part in the discussion.

MR. REX ANDERSON said he would like to take the liberty of addressing this learned Society although it was quite by chance that he happened to be present. He had come to England on a matter of Totalisator business—with regard to the installation of new machines at the Belgian racecourses—and when calling at a friend's house, he saw the invitation to this meeting of the Royal Statistical Society. The subject had attracted him immensely, and he considered himself extraordinarily lucky; it was a happy coincidence that enabled him to come into this Society, learned in all branches except perhaps that of racing, when it seemed that their attention was now being directed to that field.

After the remarks of Sir Clement Hindley, many of his own fell to the ground, but the chief thing to be realized was that the actual value of the Totalisator to any country was that it enabled anybody, whether a small or big betting man, whether he bet for the pleasure of it or to increase his revenue, to obtain the same odds and advantages as the next man. What happened on the racecourse was really a minute percentage of what was happening in other parts of the United Kingdom.



When Mr. Churchill made up his budget, he suggested that £200 millions was expended on racing, 20 millions on the racecourses and £180 millions in the towns. In Lord D'Abernon's opinion it was about the same as the drink bill, and he put it at £400 millions.

Up to now he felt that this paper of Mr. Gordon's—which showed extraordinary insight into a new business—was a little early, because the figures on which he had established his paper only covered one thousand races. The Totalisator had only been in use for about eighteen months, and these fantastic prices for outsiders would gradually disappear. If this matter were to be discussed in another twelve months or two years' time, another law would probably be found to be operating.

With regard to the fraction, Mr. Anderson believed it worked out at about 1.95 per cent. on top of the 6 per cent. When the Totalisator was established, it was with the idea of cleaning up the practice of racing in this country. Racing had been recognized by all the greatest men in the country, but unfortunately its devotees included many less desirable persons. If then the determination was to make racing clean, then it did not seem right to have this fraction operating. In Belgium 11 per cent. was taken, plus the fraction. He would rather see them take 13 per cent. and eliminate the fraction.

With reference to Dr. Isserlis's remarks, it must be remembered that the bookmaker could lose, but the Totalisator could not. (He left out the matter of overhead charges.) The Totalisator went home with its percentage, having made up its mind after it had the money in its tills, but the bookmaker made up his mind before he had the money in his till. The market on the course was only operated by big racing men. The result was that the bookmaker was afraid. He said, "I will lay you 4-1," and the man next would only offer 3-1, because he did not know the weight of money that would come on to the horse. Time after time the bookmakers went home losing.

Undoubtedly the Totalisator was the only possible means of cleaning up the "betting" end of the sport of racing in this country. When he read some advertisements which suggested "Bring your wife and children to lovely Lingfield," he could not help feeling that it was rather impossible. Abroad it was possible to take one's wife and children to the racecourse; there was no rowdyism; if there was the slightest roughness the police interfered and it was stopped. In England it was very different. The work would never be achieved with the Totalisator until people realised that it must get large sums of money from the towns. For every pound invested on the racecourse ten pounds were invested in the towns; when that had been diverted to the racecourse coffers Mr. Gordon's figures would be altered. Up to now the returns of the Totalisator represented approximately 1 per cent of the combined betting on the courses and in the towns.

LORD HAMILTON OF DALZELL said he would like to join with Sir Clement Hindley, as a colleague on the Racecourse Betting Control

Board, in thanking the reader of the paper for the work which he had done on a problem which was very interesting to members of that Board. He believed the Board was doing interesting and useful work. People would bet about something, and it was better that the subjects on which they betted should be regulated. Not long ago he was told a story of a young gentleman who was perhaps more at home in the betting ring than the Law Courts, who, when a murder case was being tried at the Old Bailey, was so worked up by the eloquence of the prosecuting Counsel, that as he sat down he shouted out, "He swings for a tenner!"

Many years ago it had been his duty to assist a Minister in the work of his Department in the House of Lords who was more responsible than anyone else for the legislation which led to the installation of the Totalisator—Mr. Winston Churchill. It was at the time when Mr. Churchill was at the Board of Trade, and they had a Bill to regulate and, if possible, put a stop to gambling going on in marine insurance policies. A number of eminent gentlemen from Lloyds came to the Board of Trade, and at first they were a little reluctant to accept the restrictions about to be placed upon their activities. Mr. Churchill pointed out that if people wanted to gamble they should gamble on which of two horses was going to pass the post rather than whether a ship was going to the bottom or not.

Lord Hamilton did not quite share the previous speaker's pleasant recollections of Belgian racing. To be quite honest, however, he had only been to one race in Belgium, when he took a horse over to Ostend, ran it and got beaten by a short head.

With regard to the general purport of the paper, he was really in agreement with most of what the reader had said, but it was not a matter that could be argued on very high ethical lines. The position of the Totalisator Board was that they were stake-holders; people who wanted to bet deposited money with the Totalisator, and it was the duty of the Board to redistribute money to those people who foretold the result of the race correctly. On really ethical grounds he did not think the system suggested by Mr. Gordon could be defended—it was after all a system of robbing your Peter customers to pay your Paul customers—although on grounds of expediency much might be said for it. That was really the thought that was in his mind while listening to the discussion, and it had been in his mind for a long time when members of the Board had wondered whether they should not adopt some such system, and he was therefore grateful for the blessing given to the proceeding by the Royal Statistical Society.

MR. L. R. CONNOR said that a good *prima facie* case had been made out for the revision of the present system of deduction of fractions, but that considerations of general policy were involved, and there was also the difficulty of justifying any complicated remedy in the eyes of the ordinary backer. No single formula or scale of deductions was going to secure equity for *all* classes of backers *at the same time*. The reason for this was as follows:—profit from fractions depended largely upon the way in which

backers laid their bets; *i.e.* the extent by which they were attracted by prospects involving long and short odds respectively, and a formula must be evolved which would give expression to these varying preferences. Immediately the new formula were introduced, backers would change their preferences, with the result that still a new formula would be required. That might go on indefinitely. Assuming that one were satisfied with a rough balance between the claims of backers of favourites and backers of outsiders, it would seem that a formula could be evolved which would meet the requirements.

It might be possible to change the object of the formula so as to improve the competitive position of the Totalisator at the expense of the equitable position. That was a matter of policy which it was not for him to determine, but he would like to put it forward as something which might receive consideration.

Looking at the matter from another standpoint, it would appear that these differences between starting and Totalisator prices could not last very long. The public had a choice as to where they lay their money, and the bookmakers had a choice of laying off bets on to the Totalisator if they chose to do so.

Mr. Connor wished to put in a plea for a formula which could pay to the *nearest* penny. Mr. Gordon had certain objections to this proposal, but in his own view such objections would be outweighed by two advantages: that calculations would be greatly simplified, and that the principle would be intelligible to the ordinary backer.

In the first part of the paper Mr. Gordon had made certain simplifying assumptions, but if he had not made these assumptions his argument could hardly have been made intelligible. His chief assumption (see p. 44) was that the percentage of tickets staked on the winner was evenly distributed. This introduced a small theoretical error which might, however, be neglected in comparison with the larger errors flowing in from elsewhere. He did not wish to comment upon the assumption, but only to suggest that it should have had a little more attention.

On p. 48 there appeared the real difficulty: the attempt to bring in the incalculable element of backers' preferences in the shape of a frequency curve which showed the expectation of the various dividends paid. Mr. Gordon's curve was a bad fit, but it must be borne in mind that the curve was intended to be illustrative and not conclusive. If he had taken a larger sample it would have involved an enormous amount of work, unjustified at the present stage of the enquiry.

Mr. Gordon had seized upon the chief cause of heterogeneity, *viz.*—varying number of runners per race. Another anomalous feature was the variation from time to time in public opinion as to the results yielded by starting price betting and those yielded by the Totalisator.

Possibly the difficulty of fitting the high peak of the curve might be overcome by choosing a new independent variable, *e.g.* the logarithm or the reciprocal of the dividend. If this idea failed, perhaps the introduction of an additional constant to get round the awkward

turning might be effective. Finally, an artificial element was introduced into the whole problem by the fact that the Totalisator never paid out less than 2s. and returned the stakes when no one had backed the winning horse.

Mr. Connor expressed his appreciation of the ingenuity of the paper, and the skilful way in which Mr. Gordon had developed his analysis and made these difficult matters intelligible.

The vote of thanks was now put by the Chairman to the meeting and was carried unanimously.

MR. A. P. L. GORDON: I propose to reply very briefly now, and to give a more considered reply to be printed in the official Proceedings.

To begin with the criticism made by Dr. Isserlis, I was particularly interested in his account of an investigation which he made in 1924, in which he says that on 60 per cent. of the occasions non-favourites won. That may very well be the case, for it frequently happens that a horse is well fancied without being definitely a favourite. With reference to another main point of Dr. Isserlis's criticism, that the starting price is not fairly representative of the real odds made by the bookmakers, that has been dealt with to some extent by Sir Clement Hindley; but I would add that a very large proportion—certainly three-quarters, and possibly a much larger proportion—of betting business is, in fact, transacted under the starting price rule, *i.e.* all away money has presumably been wagered by backers on starting price, or Totalisator, terms. If the Totalisator gets a reputation for paying uniformly (on all kinds of chances) a better kind of odds, then as this becomes more known the amount of away money which is laid off on the Totalisator will be very much larger.

In the first part of the report there are figures relating to chit-betting, which presumably includes most of the money laid off through the blower. Even if the chit turnover is wholly away money, its volume is somewhat disappointing. I shall be very much interested to see in the next report how this business is progressing; it does seem to me to be the ultimate aim; for the amount of betting originating on the course is a very small section of the total amount of betting in the country.

Dr. Isserlis made another point concerning the amount of profit normally taken by bookmakers. I adopted at one time a similar method of finding this out. Assuming that the bookmakers arranged their books in such a way that each horse took out £100, I obtained much the same kind of result, the variations being enormous. But I came to the conclusion that the comparison is academic (since there is practically no betting on certain horses, and no large commitments), and is therefore not really useful.

I am going to pass over for the moment the more learned criticisms of Dr. Isserlis, excepting where he says that the lowest dividend is 1s. 9d. It is, theoretically, but it is not in fact; there is a rule that the lowest dividend is 2s.

Dr. Rhodes said I might get another curve another year. It certainly has been said that this year on the flat was a season of short-priced chances; I was therefore glad to see that the mode of the theoretical curve came on the high side, although I do not think that kind of influence is going to have a monumental effect on the curve. If and when sufficient experience is gained to extend the sample, it will be better to get a better fit, and a fit probably on the Type III lines.

Passing on to Sir Clement Hindley's speech, I was greatly relieved to hear that Sir Clement had never heard of a quartile before, for I felt that many statisticians had never heard of a blower. I am rather interested in the suggestion of dividends being paid to the nearest 3d. as opposed to the next 3d. below. That leaves an expectation of profit of  $\frac{4am^2 - 100}{4m^2 - 1}$  a delightful curve which approaches  $-\infty$  for low positive values of  $m$ .

As regards paying to the nearest penny or to something less than 3d., I had assumed that I might take the cue from the Board's blue-book, which Sir Clement now declares to be publicity. I assumed that the objection to handling large sums in copper on the racecourse was real. Lord Hamilton said that the Totalisator was in fact a stake-holder, and criticised the "robbing Peter to pay Paul" type of policy. Personally, I suggest no such policy, except in so far as Peter has already robbed Paul. When it is decided that the minimum profit shall be 6 per cent. you are saying in effect that you will take a higher percentage from the backers of favourites than you will from others; it is that position I should like to see rectified, for it is a very genuine robbing of Paul in Peter's interest.

I think it best to defer the rest of my reply for publication in the *Journal*.

After the meeting, the following contributions were received.

MR. KENNETH ELBOURNE wrote: I do not wish to touch on the mathematical aspect of Mr. Gordon's paper except to agree with previous speakers that he was, to say the least, on dangerous ground in attempting to fit a curve to data from too small a sample. It is on the general purport of his paper, and especially on certain of his premises, that I would like to comment.

On p. 31, in his opening paragraph, Mr. Gordon states that "Many considerations, both of speed and of convenience, must have some bearing on future developments; but the odds paid form the most direct point of competition." On this premise and on the logical outcome that better dividends, at the point where dividends now compare unfavourably with bookmakers' odds, will produce greater throughput, Mr. Gordon builds a fascinating structure which, apart from its foundation, has few weaknesses.

Unfortunately, it is by no means as certain as it appears obvious that comparative prices are the criterion of Totalisator popularity. What is the secret of this popularity is perhaps difficult to decide. Of causes applicable to all racecourses, probably absolute, almost

governmental, security comes first, closely followed by a certain atmosphere which removes that embarrassment which so many feel in dealing with a bookmaker, and closely followed again by the simplicity with which Tote calculations can be checked by the "Man in the ring." Be that as it may, it suits my present purpose to show that competition in odds is possibly a long way from being the chief factor. It is a fact, in support of which I cannot quote statistics because my information is confidential, that taking race-course by racecourse and comparing the money passing through the Tote each day with the attendance of racegoers each day, there is a fairly defined tendency for the betting per head to be constant at all meetings at any one course. The figures for course A, however, may be radically different from those on course B. In so far as this tendency exists—and it is being closely observed by the Control Board's statisticians—it does seem to demonstrate that the general reasons for Tote popularity are severely modified by local conditions and local preferences. If these local circumstances are, as I suggest, paramount, then the competition in odds, provided it never becomes one-sided against the Tote, is not of the importance Mr. Gordon assigns to it.

Another factor, again not definite but sufficiently well defined to be important, is the characteristic that the Tote pools are almost always, other things being equal, larger than usual on the race following one won by a short-priced horse. The reason for this is, of course, that a large number of people have won amounts large enough to encourage them to bet higher, but not large enough to make them want to stop betting and conserve their winnings. Granting this explanation, I submit that this is still evidence against Mr. Gordon's premise, because, as he has shown, in much more than half the races won at short prices Tote odds are worse than bookmakers', and one would, therefore, not be surprised to find, in the majority of cases, no increase or even a fall in the Tote pools following a win by a favourite.

Entirely in passing, I would say that the business of dividend calculation in the "Control room" is far from being as difficult or as cumbersome a procedure as might be surmised from some of Mr. Gordon's remarks.

In point of fact, these calculations are performed on electrical Monroe Calculating Machines, by a staff which is expert in their use. The Win dividend is calculated and checked in about thirty seconds and the three Place dividends in about eighty seconds. As both proceed independently, it is fair to say that the whole of the calculations can be completed and checked within ninety seconds, or at the outside two minutes.

My final comment is to follow up the point made by the proposer of the vote of thanks. He pointed out that a comparison of odds between Totalisator and Bookmakers' starting price does not take cognizance of higher prices offered by the bookmakers' price toward the close of the market. True though that is, it must be realized that quite as many prices lengthen as the market goes on as do the reverse. In other words, probably, taking all horses together, the

margin of advantage to the layers is approximately the same throughout the market, greatly though the price of an individual horse may change.

MR. R. M. HAMILTON wrote : The problems raised in this very interesting paper are extremely difficult, as the factors depend partly on mathematics and partly on mass psychology. The writer states that the first object of the investigation is to ascertain the true comparative position, and this can only be done by an investigation into the methods of making a book as well as the method by which the Totalisator operates.

The true probability of a horse winning a race is made up of a number of components, only a few of which can be known before the event, but after the event accurate figures can be obtained; for example, out of a large number of events a certain proportion of favourites win. If you divide the number of winning favourites by the number of events you will get the average probability of a favourite winning. Now both the bookmakers' odds and the Totalisator dividends are approximations to this true chance.

Taking bookmakers' odds first. The odds adjust themselves to a very close relationship to the true chances, because there are a large mass of backers who are ready to take advantage of any error in their favour made by bookmakers, and if a bookmaker cramps the odds unduly there are other bookmakers who are only too pleased to take their clients' bets. In this way the operation of the Law of Supply and Demand over a long period gives an astonishingly accurate relationship between odds and chances. The operation of this Law has an effect on the making of a book.

A large number of backers blindly "follow the money"; in other words, "intelligent" backers make a horse favourite, then a number of ill-informed backers back the horse because it is favourite. If this money were allowed to reduce the odds against the favourite to its full arithmetical value the odds would be enormously less than the true chance of winning. When this occurs, the professional backer becomes layer and offers better odds than the bookmakers, which eases the demand and automatically lengthens the odds. The odds against the favourite are thus adjusted so as to be less than the true chance and more than the money taken warrants. The odds against the second and third favourites are closer to the true probability, because there is not the money from "favourite backers" to reduce the odds. Then, as the horses become less backed, the position becomes reversed and the odds offered against outsiders become very much less than the true chance on the average. The reason for this is that out of, say, six outsiders starting at "100 to 7 others," only one may be backed at all, and this one probably by the stable concerned, who happen to know that it has an excellent chance of winning. The bookmakers do not wish to lay outsiders except to "mugs," what they want is that an unbacked outsider should win. This is called a "skinner," and is the main source of profit to the bookmaker.

Looking at this from the point of view of the bookmaker, he

makes an average profit of about 3 per cent. on favourite bets, although when a favourite wins he loses on the race. I give a table below which gives the results of all flat races from 1890 to 1914. These figures cover over 125,000 chances and are obtained from data published in *The Odds Analysed* by T. G. Kirby. The number of races covered is 44,721. Favourites include joint favourites. Second, third and fourth favourites are only taken where there is a further quotation in the betting.

				Average Odds.	Per cent. loss to Backer.
1st Favourite	...	...	...	1.66 to 1	3.4
2nd	...	...	...	3.7 "	1.8
3rd	..	...	...	5.9 "	2.9
4th	..	...	...	7.7 "	6.5
Average	...	...	...	3 to 1	3

The per cent. loss to backers corresponds to the deduction or profit of the bookmaker. This increases rapidly and becomes 100 per cent in the case of the unbacked horse. In order to get an idea of the profit made by a bookmaker, regard must be taken of his class of customer. The really big man on the rails in Tattersall's has an immense turnover of large bets, and if all these bets were at starting prices his profit would be about 3 per cent. In fact he lays a number of bets at shorter prices than starting prices and, of course, he has a certain number of "mug" customers. Both of these factors increase his profit.

The second class of bookmaker has a mixed clientele consisting partly of instructed backers and partly of "mugs." These bookmakers will have a much smaller turnover, with a profit between 10 per cent. and 15 per cent. There is, finally, the street bookmaker, whose profit is over 20 per cent. The actual profit is not so important as the loss sustained by the various types of backer. If the bookmaker made his book strictly to figures, the favourite would be at much shorter odds than it is now. This means that he backs the other horses collectively to beat the favourite. The Totalisator, as at present operated, backs the favourite to win, as is shown in the paper.

A point that cannot be too strongly stressed is that what affects the backer is not the total deduction from the pool, but whether or not the dividends paid represent a better or worse probability than the true chance of the horse winning. To take an absurd case as an illustration—if all backers except one assumed that the favourite would be a better price with the bookmaker (there being no indicator), if the favourite won the single backer would receive the whole pool. For the same reason if, by altering the incidence of the deduction, a large body of backers of favourites are induced to use the Totalisator, the odds against favourites would become worse instead of better.

If it were possible so to graduate the deduction that it was directly



proportional to the bookmakers' deductions the Totalisator would always beat the bookmakers' prices (provided that backers patronise both in the same proportions). This is so because the 8 per cent. all-in deduction of the Totalisator is on the whole less than that of the bookmakers.

I am in agreement with the writer that the flat 6 per cent. plus large fractions is bad and that a level expectation of profit such as he proposes is better, but I do not admit that even this is the "fairest" to the backer. To deduct  $a$  per cent. of the winnings of each backer is better than the level expectation for this reason—again to take an absurd case—if every backer chose the same horse and it won, although the same amount of wages would be paid, no service would have been rendered to the backer, as his money is simply lent to the machine for a time and then returned to him; thus he has no gamble. The Control Board admit the correctness of this by foregoing their deduction in such a case, but the point that I am making is that the deduction should be proportional to the amount of gamble indulged in by the backer. Another instance of this is that of the 2s. dividend; here quite the reverse of a service has been rendered; either the backer loses his money (if the horse does not win) or he gets it back without any profit. In fact the stakes on winning horses remain the property of the backer and there is no right to deduct anything from them. Deductions and taxes should in fairness always be deducted from profits and not from turnover.

To go still further. The absolutely fair way of deduction is to do it in proportion, not to the actual winnings, but to the winnings represented by the true probability of the horse winning. This, of course, is impossible for the machine, but to a certain extent is approximated to by the starting prices. Excellent examples of a method of deduction which is fair to all (in distribution if not in amount) is the zero at roulette and the skinner on the Turf.

The writer recommends that the line in Graph I ( $\alpha$ ) should be horizontal, and I suggest that it should start at 0 and rise, as a per cent. of winnings, to such a figure that the mean dividend paid shall bring in the required per cent. on turnover.

With regard to the Frequency Distribution curve on Graph 2, I think that the factors that affect this curve are so many, each tending to distort it from a true probability curve, that no curve could be obtained from which it would be safe to predict the figures of any season. A few factors are—(a) a dry or wet season: this affects the going, which, if hard, reduces the average fields and average dividends; (b) violent changes of weather which upset form, increasing average dividends; (c) whether the heavy gambling stables have a good or bad year; (d) general monetary conditions in this country, which affect the incidence of backers' money. These and others will change the shape and type of curve from season to season.

MR. GORDON'S written reply was as follows: I am indebted to Mr. Connor for his suggestions in regard to curve-fitting. I should

certainly have preferred to fit the actual percentages of winning tickets, but, since these data are not (to my knowledge) made public, I had to be content with the declared dividends: throughout this work I have neither used nor seen any confidential or unpublished figure. To have used the reciprocals of dividends, as has been suggested, would have necessitated such large inequalities of group-interval as to present a serious objection. Nor am I satisfied that the revision of the calculations would, as Mr. Connor supposes, cause backers to change their preferences; for the latter are determined, partly by the appearance and form of the horses, and partly by the expected odds. However efficient the indicator, nobody can tell the exact odds at the time of making his wager: people are influenced, as between bookmaker and the machine, by their impression of the relative odds paid on winners which they have previously backed. The type of change suggested will scarcely affect the paddock calculations of the prospective backer; but it will materially affect the final result regarding winners backed by the largest contingent of backers. The horse-distribution of the pool, too, cannot approximate to that of the money retained in the ring, unless the turnover is large: under present conditions, a ten-pound bet materially affects the odds. If this approximation should be reached, Totalisator and bookmaker will compete in "costs of production," and hence in price.

I hope that neither Dr. Isserlis nor Dr. Rhodes attach great weight to the figures which they have sought to substitute for mine. At the risk of involving Dr. Isserlis once more in mathematical controversy, I would point out that he has defined his upper limits by the function  $\frac{370(2m-1)}{m(m-1)}$ ; if dividends are to be paid to the nearest threepence (above or below), the true value of the upper limit is given by  $\frac{1480}{2m-1}$ .\* This alteration, I hesitate to say "mistake," materially affects Dr. Isserlis's argument: the change is shown in the following table:—

Figures Given in the Paper.	Figures Quoted by Dr. Isserlis.	Payment to Nearest 3d. (Correct Figures).
7,790	7,811	7,789
7,105	7,063	7,047
5,098	5,109	5,103

I have not been able to verify the figures quoted by Dr. Rhodes. They are clearly derived from some function other than that which he describes; and the figures determined from his description differ so radically from them, that his argument altogether disappears. The various figures are given in the following table: it will be noticed

\* It will be seen from the formulæ on p. 41 that this expression is also the lower limit for payment of the next lower dividend, assuming an even distribution of winning percentages.

that those taken from the limit described by Dr. Rhodes correspond, in fact, with payment to the nearest threepence.

Figures "As Now Paid."	Figures Given by Dr. Rhodes	Figures Presumably Intended.	Figures Given in the Paper.
8,355	8,387	8,705	8,796
7,520	7,548	7,789	7,790
6,836	6,862	7,047	7,105

Concerning the fit of the curve, I am loth to waste space in the repetition of arguments already before the Society. My purpose was illustrative; any curve fulfilling certain elementary conditions, and providing it did not exaggerate the tendencies discussed, would have been valid. In my opinion, and in view of the heterogeneity, the data were insufficient for accurate fitting: for this reason I was content with a very rough fit, and thought it worthless at this stage to spend time on elaborate computations of probable error. It is obvious from the chart that figures derived from this curve, at least in the low dividend ranges, will be less good than those which might be derived from a perfect fit; for this reason, my argument remains valid. Should executive action be decided upon, it will be necessary, *inter alia*, to extend the sample, determine a type, and fit a curve; this is in the province of the Control Board. These arguments may be remembered by anybody whose study of this part of the paper extends to the explanatory text.

I am much indebted to Mr. Hamilton and to Mr. Elbourne for their interesting contributions. If I may apply the former's terminology to the latter's argument, I am surprised that the Totalisator should aim purely at mugs' money. The local variations in turnover, which Mr. Elbourne quotes from confidential figures, show that the regular racing public does not use these facilities: the Totalisator depends, at present, upon occasional visitors, who contribute very little towards the volume of betting. The turnover is so small that a stable-commission, or any even moderate gamble, upsets the odds.

The serious backers, too, are not greatly impressed with the Totalisator's security. They bet chiefly in Tattersall's, and they know the credit of the men they bet with: welching happens most often on popular occasions, such as Derby day; and it is chiefly on the Downs side of the course. Totalisator advantages of this description will never affect the big money; this is chiefly made up of funds transferred from the towns, the destination of which is influenced by purely financial considerations. Away money will grow in volume when starting-price clients specify Totalisator odds; this will always depend upon competition in prices.

I can make nothing of Mr. Elbourne's point that pools are larger after a popular victory. This proves nothing beyond the tautology that, on such occasions, a lot of people have a little more money than before. At a given meeting the Totalisator public tends to be fairly constant: it is only on the way home that the average backer compares the odds.

If space and relevance permitted, there would be many questions I should like to put to Mr. Hamilton, following his interesting dissertation on bookmaking. The effect of this, as I understand it, is that the bookmaker's profit-curve starts below zero and slopes upwards at an increasing gradient. The "skinner," which compensates bookmakers for their loss on popular victories, may be at any price between 100-8 and 300-1, according to the number of runners.

I cannot imagine the possibility, either of legal sanction or of popular acclaim, for a system under which Totalisator profits depend on skinning. Lord Hamilton has pointed out that the Board's position is that of stake-holder: any system of taking skimmers is legally objectionable. At present the victory of an odds-on favourite is a very definite skinner for the Totalisator; when the dividend is 2s. 3d., winning backers may have forfeited anything up to half their legitimate winnings. At present the Totalisator acts, not as a stakeholder, but as an automatic mug-punter; it backs the favourite to win, simply in virtue of the animal's position in the betting. There is no express sanction for this, but it may be covered by Section 3 subsection 8 of the Act: but if the Totalisator is *legally* a stakeholder, then the present system of calculation is certainly illegal. My own objection is not on legal grounds, but rather that the present system, as a business concern, defeats its own purpose.

The following table, which is comparable with that on p. 43, shows the maxima under the two systems mentioned by Sir Clement. System A assumes payment to the nearest threepence, above or below, the calculated amount; System B assumes a deduction from losing stakes only. In both cases the deduction taken is  $7\frac{1}{2}$  per cent.: the average profit would be rather below this figure.

Dividend.	System A.	System B.
s. d.		
2 3	8,705	8,809
2 6	7,789	7,872
2 9	7,047	7,115
3 0	6,434	6,491
3 3	5,920	5,967
3 6	5,481	5,522
3 9	5,103	5,138
4 0	4,774	4,805
4 3	4,481	4,512
5 3	3,609	3,627
6 3	3,020	3,032
7 3	2,596	2,605

The figures for System B are slightly better than those given in the paper; but the latter would be greatly improved, especially in the low dividend range, by a better fit; in addition, the System B deduction would have to be higher, and the figures smaller, if an average profit of  $7\frac{1}{2}$  per cent. were to be secured. In both these cases the curve of average profit slopes in the opposite sense

to that of Graph I (a) : the machine would be a better bookmaker than at present, but the legal objection would remain.

As a stakeholder, the Totalisator must take an equal profit from all classes of backer. Unless dividends are to be declared at closer intervals, a fixed expectation is the only system fulfilling this condition. To establish such a system it would be necessary to extend the sample until enough data were included to counteract the disturbing factors mentioned by Mr. Hamilton. Until the experience extends over several seasons it might be necessary to use a system of parabolas in lieu of a single curve : in any event, the curve should be revised each year, until the probable error is found to be low enough to allow accurate inference.

Apart altogether from statistical and legal arguments, the public appeal of a revised system would be considerable. Backers seldom check the calculations with any degree of accuracy : active catering for the supporters of short-priced chances could not fail to achieve popularity. In this way the good-will of such backers might more easily be secured ; and this should attract enough of the non-favourite bets, made by the same backers, to keep the horse-distribution reasonably constant. Single pools are seldom greater than £1,400, and the market is therefore weak ; serious commissions are, quite naturally, placed elsewhere. The only way to secure the money is to increase the turnover ; and this involves a policy which caters for the chances most generally and genuinely supported.

As a result of the ballot taken during the meeting, the candidates named below were elected Fellows of the Society :—

Edgar Charles Fieller.

John Jewkes.

William Jocelyn Lewis Palmer.

Moolavil Joab Simon, B.A.

John William Simpson.

Percy William Stephen.

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## MISCELLANEA.

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## THE INTERNATIONAL INSTITUTE OF STATISTICS.

By A. L. BOWLEY, Sc.D., F.B.A.

At the invitation of the Japanese Government the International Institute of Statistics held its Nineteenth Session at Tokio from September 15th to 20th, 1930. The Session was "extraordinary," being interpolated between that at Warsaw in 1929 and that arranged for Madrid in September, 1931, no domestic business that needed the full strength of the membership was conducted, and the form of the meetings was modified.

About forty members attended, drawn from seventeen countries, Great Britain being represented by Messrs. Bowley, Dunlop, Godfrey and Hilton. In addition there were over thirty delegates and invited persons from another eleven countries, and a large number of Japanese officials and professors.

A great part of the expense of travelling was met by the generosity of the Japanese Government, and the members were lavishly entertained, and received by two members of the Imperial family and by highly placed dignitaries with great courtesy and ceremonial etiquette. The admirable organisation and, presumably, the initiation of the Session were primarily due to the untiring efforts of Count Yanagisawa, a member of the Institute.

At the sectional meetings of the Institute it has been the custom to receive reports of Committees, discuss them and pass resolutions relating to their subjects or initiating new investigations, while little time has been devoted to other papers. At Tokio there were only two short reports, and the sections devoted their time to the reading and discussion of original papers offered by members, delegates, and Japanese statisticians. In all 53 printed papers were presented, 20 by Japanese, 2 by Chinese and 31 by other nationalities, covering a very wide range of subjects, and careful grouping

and selection was necessary to allow opportunity for discussion of the more vital questions. Many were treated as merely formal or were accepted without reading in the absence of their authors, with the result that adequate time was available for serious consideration of the more novel and interesting communications in one or other of the three sections, each of which met on four days. In fact, the actual meetings were more provocative of serious criticism and illuminating exchange of ideas than has been the case in recent Sessions of the Institute. Since the papers will not be generally available for some months, a list is appended of their subjects and authors. A complete file is deposited in the Library of the School of Economics.

Perhaps the chief interest of the meeting was the insight obtained into the development of statistics in Japan. As Mr. Shimojo's paper shows, from about the date of their first adequate Census (that of 1920) great importance has been attached to statistics both officially and in the Universities. Official statisticians are carefully instructed in principles and technique. Several special enquiries, *e.g.* into agricultural production, family expenditure, etc., have been conducted with apparent accuracy and ingenuity of method. Where gaps in national statistics are apparent, serious efforts are made to fill them up. The number of Japanese papers submitted, some of them of considerable merit, and the regular attendance of those connected with the Session, show how numerous is the group who are seriously interested in statistics and in statisticians. At the Library of the University of Kyoto there is a remarkable collection, not only of current journals and recent text-books, but also of rare editions of statistical classics, some dating from the eighteenth century. There is no doubt that most of the official statistics of Japan have arrived at the stage of good technique and trustworthiness. The people appear to be naturally accurate arithmeticians, and, judging from the response to the demand for family budgets, to regard it as a sacred and national duty to give precise information. These budgets received from 6,505 families, lasting over twelve months, and balanced daily to a sen, are very remarkable. The compilers were rewarded each by the present from the Imperial Government of a table-clock and of a booklet summarising the progress of the enquiry. As regards initiative we may instance the issue of results, based on a sample of 1 in 1000, of the 1920 Census in order to recover the time lost by the earthquake, and the subsequent comparison with the complete statistics. In the Census taken on September 30th, 1930, there is a question on unemployment, as to the extent of which there is considerable doubt, and on the prompt tabulation of the answers the allocation of money already set aside by the Government

for constructive works will depend. So far there appears not to have been any new development of statistical theory, but only the acceptance of what are believed to be the best methods already in use and their adaptation to Japanese conditions. Among the number of keen students, however, there may well be some who will add to the general body of statistical theory and technique. There was also evidence of a growth of practical interest in statistics in China.

In connection with the papers presented to the first section, there was a good deal of discussion on the utility and limitations of forecasts of population. The conclusion, perhaps, is that calculations should be made on several reasonable hypotheses about the future of birth- and death-rates and migration, so as to find within what limits the numbers in different grades of ages and in the population as a whole can reasonably be placed. Part of the same ground was covered by a further interchange of ideas after the relatively low expectation of life in Japan had been shown in Mr. Saito's paper. The papers on the construction of mortality tables, and on the Census problems in Eastern populations were well discussed.

In the second section attention was directed to the technical question of the best measurements of inequality or of concentration of incomes, partly with reference to Pareto's law; and also to the changes of consumption of primary necessities, and to the emergence of the new problem of the use of the increasing surplus in developed countries after necessities had been met. The papers on national income were for the most part recapitulations of work already published. Mr. Platzer in his paper on the retail prices of manufactured goods introduced a subject on which as yet little is known.

In the third section there were few papers, but these were of such outstanding interest that it was difficult to find time for adequate discussion. M. Simiand's appeal for a closer study of the statistical evidence that can illuminate historical problems may lead to a closer co-operation between historians and statisticians, such as already exists in the study of mediæval and later prices. Messrs. Hilton and Zahn between them raised the whole question of the relationships between money wages, real wages, cost of production and unemployment in a most stimulating manner. It is hoped that various existing committees of the Institute will co-operate in the elucidation of some of the problems, statistical and other, that have been defined.

A study of the subjects that were discussed will demonstrate that the Institute has still an important function, in spite of the progress of international statistical work at Geneva. Not only are there technical questions of measurement still unsettled, but also there are regions in which pioneer work is not sufficiently advanced to allow satisfactory official enquiry. The extension of the realm of scientific



measurement proceeds continually; and such co-operation between official, professorial and private statisticians as is furthered by the interchange of printed studies, discussion and personal conversation that take place at the Sessions of the Institute, should be of great value in suggesting and defining most useful fields of research.

## APPENDIX.

### Première Section.

#### (Statistiques Démographiques.)

- L'extension et les effets des inexactitudes dans les déclarations de naissance pour les nés dans la dernière période de l'année . C. GINI.  
 Application de la méthode représentative aux matériaux du premier recensement de la population du Japon . T. KAMEDA.  
 Calcul de prévision de la population du Royaume d'Italie de 1921 jusqu'à 1961 . C. GINI.  
 L'horoscope de la population du Danemark . A. JENSEN.  
 La population de l'Ukraine jusqu'en 1960 . M. PTOUKHA.  
 Evaluation de la population future des Etats-Unis W. S. THOMPSON.  
 La population de la Chine . W. F. WILLCOX.  
 Population du Japon. 1920 et 1925 . T. HASEGAWA.  
 Recensement de la population présente dans la journée dans les districts centraux de la ville de Tokio . S. KANAYA.  
 La population et ses problèmes dans l'Ere de Tokugawa M. E. HONJO.  
 Etudes statistiques des effets eugéniques de la guerre  
 A. SAKAMOTA et K. KÔ.  
 Le centre de la population de Hokkaido (Japon) . K. TAKAOKA.  
 Sur les travaux statistiques récents au Japon . Y. SHIMOJO.  
 L'uniformité dans les tables de mortalité . C. GINI et L. GALVANI.  
 L'uniformité dans le calcul des tables de mortalité . M. HUBER.  
 Sur la Table de Mortalité des Japonais, No. 4 . H. SAITO.  
 Le recensement de 1930 aux Indes Néerlandaises J. VAN GELDEREN.  
 [Comparison of Life-tables, Japan, 1912, with Belgium, 1872  
 S. TAKARABE]

### Deuxième Section.

#### (Statistiques économiques.)

- Méthode de l'investigation statistique concernant la production agricole au Japon . R. NAGASAWA.  
 Les modifications des consommations . G. MORTARA.

L'étude des éléments statistiques les plus instructifs en vue des prévisions économiques à rassembler dans les principaux pays

A. L. BOWLEY.

Les indices de la disparité des revenus . . . L. VON BORTKIEWICZ.

La répartition des revenus mobiliers en Italie

C. GINI et R. D'ADDARIO.

Quelques méthodes pour mesurer la répartition des revenus en Autriche (1903-1910) . . . F. SAVORGNAN.

La statistique des prix des titres, du mouvement des affaires dans les bourses, et des liquidations pour titres dans les chambres de compensation . . . R. BACHI.

Note concernant l'établissement d'une statistique internationale des banques ou subsidiairement des dépôts en banque CH. DE LANNOY.

La statistique et le mouvement des affaires . . . L. MARCH.

La statistique des prix de gros de produits industriels finis

H. PLATZER.

La récession de 1929-1930 aux Etats-Unis. . . W. M. PERSONS.

Développement des Services publics urbains dans quelques Capitales d'Europe . . . M. G. CADOUX.

Le Revenu National de la Hongrie Actuelle . . . F. DE FELLNER.

L'évaluation de la richesse privée et du revenu national de l'Italie avant et après la guerre. . . C. GINI.

L'évaluation de la richesse nationale et du revenu du Japon propre K. MORI.

La fortune et le revenu de la population néerlandaise

C. VERRIJN STUART.

La statistique des modifications du régime alimentaire de la population du monde . . . W. WINKLER.

Les travaux préliminaires sur les statistiques des finances publiques J. PIEKALKIEWICZ.

### Troisième Section.

#### (Statistiques Sociales.)

La statistique de la demi-migration (Pendelwanderung) H. LOSCH.

Définition du transit au point de vue des voyageurs . . . J. CRAIG.

Enquête sur les budgets de famille au Japon, 1926-1927 T. MATSUDA.

Statistique des Fonctionnaires . . . H. W. METHORST.

Des possibilités de recherches statistiques historiques F. SIMIAND.

Le prix du travail humain dans sa signification pour la production et la consommation . . . F. ZAHN.

Chômage et salaires réels . . . J. HILTON.

Le travail féminin au Japon . . . T. MORITO.



THE BURDEN OF TAXATION ON THE VARIOUS CLASSES OF THE  
COMMUNITY.

A Paper read to the Study Group of the Royal Statistical Society  
on 6th May, 1930.

By D. M. SANDRAL.

A WEEK ago your Secretary asked me to read a paper to-day. Before complying with this request I was assured of the indulgence of your criticism. I address myself to you with all humility and in the confident expectation that I shall learn more from the subsequent discussion than you from my paper.

This subject has been dealt with three times in the last eleven years—by Sir Herbert Samuel in his Presidential address to this Society in 1919, by the Report of the Colwyn Committee in 1926 and by Mr. D. Caradog Jones in a paper read to this Society in 1927. I propose firstly to examine the methods utilized in these three investigations, and to indicate how far I follow them, secondly to construct a table showing the percentage of income various classes are paying in taxation based on the estimated revenue for 1930–31, and to present a chart comparing my results for this year with the figures of the Colwyn Committee for 1918–19 and 1925–26, and thirdly to suggest some conclusions.

I realize that estimates for the current year may vary considerably from actual results. But the changes proposed in the present Finance Bill, though they have little or no effect on the amount of taxation payable by the great mass of taxpayers, alter considerably the locus of the burden. It is really the higher rates of direct taxation proposed by the Government that make it desirable that the subject should be re-examined.

I propose to omit local taxation from this enquiry. It is noteworthy that relief given to local rates has necessitated additional national taxation. Obviously this relief is not a total loss to the National Exchequer, but up to the present it appears that the revenue has benefited little, if at all, from the rearrangement of burdens. I exclude any reference to the national expenditure. Although Sir Herbert Samuel included profits from the Post Office amongst our tax burdens, I propose to omit them.

In order to make clear the changes which have taken place in taxation, I submit a table of the chief taxes in force together with

the yield for the years 1918-19, 1925-26 and 1930-31 (estimated). I have taken the yields of the 1930-31 rates at a full year's estimate. I also show the population and the cost-of-living index number.

*Total Net Receipts.*

(1) Inland Revenue Duties.

(2) Customs and Excise Duties.

	1918-19.	1925-26.	1930-31.
	£ (thousands).	£ (thousands).	£ (thousands).
(1) Inland Revenue Duties :—			
Income Tax ... ..	257,708	258,065	263,000
Super-tax ... ..	35,560	67,833	69,500
Death Duties :			
Estate Duty ... ..	25,144	52,861	
Legacy and Succession Duties, etc. ... ..	5,656	8,469	87,000
Stamp Duties ... ..	12,417	25,129	27,200
Inhabited House Duty ...	1,859	28	—
Land Tax ... ..	643	673	800
Excess Profits Duty ... ..	283,977	2,383	1,700
Corporation Profits Tax ...	—	11,705	—
Land Values Duties ... ..	710	262	—
Total ... ..	623,674	427,408	449,200
(2) Customs and Excise Duties :—			
Tea ... ..	16,054	5,780	—
Sugar, etc. ... ..	28,098	19,371	15,400
Other Foods ... ..	3,546	1,549	1,890
Tobacco ... ..	46,292	53,497	63,110
Spirits ... ..	24,242	49,928	41,000
Beer ... ..	25,424	82,403	80,750
Wine ... ..	1,409	3,746	4,650
British Wine ... ..	—	—	215
Entertainments ... ..	7,520	5,714	6,750
All other Duties ... ..	10,544	15,716	33,870
Total ... ..	163,129	237,704	247,635
Population (June each year) ...	43,166,000	45,040,000	45,741,000
Average Cost-of-Living Index No. (July 1914 = 100) (Ministry of Labour) ... ..	209	174	157 (latest)

The apportionment of the contributions of the various classes in the community calls for an analysis in some detail. Previous calculations have been based on a family of two adults and three children. An almost continuous decline in the birth-rate is reducing the average size of the family, but it is well to adhere to this figure because it is effective in the lower ranges of income where the pressure of indirect taxation must be calculated with the greatest care.

*Income Tax and Super-Tax.*

The burden can be calculated with precision. Although there are some dissenters, it seems well established that these taxes can be shifted, if at all, only for short periods and in peculiar circumstances. For convenience' sake I show the burden in the same table as that of Death Duties.

*Death Duties.*

The apportionment of these taxes presents obvious difficulties. Sir Herbert Samuel calculated the annual burden of the Estate Duty as equivalent to the average annual life insurance premiums which a person at the age of forty would have to pay in order to provide at death the amount of duty to which his estate would be liable. The income in each case was taken to be 5 per cent. of the capital. He was careful to point out, however, that this method put the charge of Estate Duty at its lowest. The Legacy, Succession and other Duties he treated as an addition to the Estate Duty. The Colwyn Committee enlarge on the difficulties of a fair apportionment—an exact calculation is out of the question—and draw up two tables showing the insurance premiums payable by a person aged forty-five to meet the liability when it takes place. From the first table we learn that a premium just under £20,000 is required to provide a sum to pay the duty on an estate of £1,000,000. This is eight shillings in the pound on the income from such an estate calculated on a 5 per cent. basis. In the second table they range up to estates only of £500,000, and assume that the taxpayer with £50,000 income earns half of it. As they place the figures derived from their second table in their General Table Relating Direct and Indirect Taxation to Specimen Incomes, it seems to me that they have not given sufficient emphasis to this burden. In computing the amount to be payable at death, the Colwyn Committee include the Duties payable on the value of the policy and have made the deductions allowed for life insurance in income tax payments. Since this report the Death Duties have been raised, and 40 per cent. is now payable on the £1,000,000 estate against 35 per cent. on which the Committee were working.

If we apply the Colwyn method of insurance to the proposed rates of Estate Duty and it is quite sound actuarially, we find that the burden now reaches eight shillings in the pound of income on an estate of £500,000 and reaches 12s. 10d. in the pound on an estate of a million.

As provision on this scale is not possible in view of the income and super-tax charges applying to the income from such estates, I show on my table a subsidiary calculation. The first calculation

is based on the normal premium of £3 4s. per cent. which a man aged forty-five would have to make to provide the sum necessary to leave his estate intact. This rate leads to a heavy burden, because the estate is inflated by the value of the insurance policy. But it measures the burden exactly. The second calculation is worked out on a premium of £3 and assumes that the taxpayer bears the risk. In the second case the estate is not inflated by the insurance policy, and in taking the lower premium I have deducted the 4s. which I take as expenses and profits of the Insurance Company.

*United Kingdom—Income Tax, Sur-Tax and Death Duties, 1930–31.*

(The taxpayer is assumed to be married with three children).

Income.	Income Tax Earned.	Sur-tax Income.	Income Tax Investment.	Sur-tax Income.	Provision for Death Duties.*		Total Investment.	Income.
	Amount.	Rate.	Amount.	Rate.	Amount.	Rate.	Amount.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
£	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
400	—	—	1 10 0	1	11 12	7	13 3 0	8
					9 12	5½	11 2 0	6½
500	3 3 4	1½	11 10 0	5½	16 15	8	27 15 0	1 1½
					12 0	5½	23 10 0	11½
700	9 16 8	7	39 12 6	1 1½	31 12	10½	71 4 6	2 0½
					25 4	8½	64 16 6	1 10
1,000	69 12 6	1 4½	107 2 6	2 1½	59 17	1 2½	166 19 6	3 4
					48 0	11½	155 2 6	3 1
1,500	163 7 6	2 2	219 12 6	2 11	117 5	1 6½	336 17 6	4 5½
					105 0	1 4½	324 12 6	4 2½
2,000	276 0 0	2 9	332 0 0	3 4	210 0	2 1½	542 0 0	5 5½
					158 0	1 7	390 0 0	4 11
2,500	413 0 0	3 3½	470 0 0	3 9	290 0	2 3½	760 0 0	6 0½
					231 0	1 10½	701 0 0	5 7½
3,000	567 0 0	3 8½	613 0 0	4 1	398 0	3 7½	1,011 0 0	6 6½
					317 0	2 1½	930 0 0	6 2½
4,000	882 0 0	4 5	938 0 0	4 8½	612 0	3 1	1,550 0 0	7 9½
					475 0	2 4½	1,413 0 0	7 1
5,000	1,257 0 0	5 0½	1,313 0 0	5 3	920 0	3 8	2,583 0 0	8 11
					627 0	2 6	1,940 0 0	7 9
6,000	1,637 0 0	5 6½	1,713 0 0	5 8½	1,239 0	4 1	2,932 0 0	9 9½
					792 0	2 7½	2,505 0 0	8 6½
7,000	2,082 0 0	5 11½	2,138 0 0	6 1½	1,446 0	4 2	3,584 0 0	10 8½
					1,016 0	2 11	3,154 0 0	9 0½
8,000	2,507 0 0	6 3	2,563 0 0	6 3	1,846 0	4 7½	4,409 0 0	11 0½
					1,267 0	3 2	3,830 0 0	9 7
9,000	2,982 0 0	6 7½	3,038 0 0	6 9	2,191 0	4 10½	5,229 0 0	11 7½
					1,426 0	3 2	4,464 0 0	9 11
10,000	3,457 0 0	6 11	3,513 0 0	7 0½	2,563 0	5 1½	6,076 0 0	12 2
					1,564 0	3 2	5,097 0 0	10 2½
15,000	5,957 0 0	7 11½	6,013 0 0	8 0	4,693 0	6 3	10,706 0 0	14 3
					2,772 0	3 8½	8,735 0 0	11 8½
20,000	8,582 0 0	8 7	8,638 0 0	8 7½	7,553 0	7 6½	16,191 0 0	16 2
					3,960 0	4 10	12,598 0 0	12 7½
25,000	11,382 0 0	9 1	11,388 0 0	9 1½	9,996 0	8 1	21,384 0 0	17 1½
					5,280 0	4 2½	16,668 0 0	13 4
30,000	14,582 0 0	9 4½	14,138 0 0	9 5	13,001 0	8 8	27,139 0 0	18 1
					16,732 0	4 6	30,870 0 0	13 11
40,000	19,832 0 0	9 11	19,888 0 0	9 11½	19,736 0	9 10½	39,674 0 0	19 10
					9,500 0	4 9	29,388 0 0	14 8½
50,000	25,582 0 0	10 3	25,638 0 0	10 3	32,319 0	12 10	57,987 0 0	23 1
					12,540 0	5 0	38,178 0 0	15 3
100,000	55,582 0 0	11 1½	55,638 0 0	11 1½	70,400 0	14 1	126,038 0 0	25 1½
					29,700 0	5 11½	85,338 0 0	17 1
150,000	85,582 0 0	11 5	85,638 0 0	11 5	100,600 0	14 1	191,238 0 0	25 5
					49,500 0	6 8	135,138 0 0	18 1

\* The prices in Italics are calculated by the alternative method.

As this is a matter of peculiar interest at the present time, I have shown more specimen incomes than usual and have taken the table up to incomes of £150,000.

I should like to acknowledge here the great assistance I have had in the compilation of this table from my friend Mr. L. R. Connor.

Even if we make due allowance for possible error in these calculations it is obvious that a large portion of this taxation cannot be and will not be provided out of income at all.

The surprising feature to me about the Death Duties is the wonderful response the yield has made to every increase in duty. The revenue has increased enormously in the years which have elapsed since the Colwyn Committee reported.

The proposed increase in rates of duty will reduce the number of large estates and the size of large unearned incomes at an accelerated pace. In 1928-29, the last year for which detailed figures are available, estates over £500,000 produced nearly £23,000,000, or 31.6 per cent. of the revenue from Estate Duty. The value to the revenue of large estates has not been sufficiently emphasized. At the moment I refrain from comment, and pass on to the Stamp Duties.

### *Stamp Duties.*

Sir Herbert Samuel left these duties out of account because they could not be apportioned to the incomes of families. The Colwyn Committee discuss the duties, their incidence and effects and consequences, but make no attempt to measure the burden on specimen incomes. Mr. Caradog Jones, more concerned with small incomes, ignores them. Of course they are a burden on the property-owning classes, and to ignore a series of taxes which produce up to £30,000,000 of revenue vitiates the final picture. And yet a statistical calculation is impossible. Any method of making allowance for this revenue must be arbitrary and is open to serious error. One might take the total yield as a percentage of the yield from income tax and super-tax and add to each specimen income a fixed percentage, thus accounting for the whole revenue. This would allocate too much of the burden on to the higher incomes. Another alternative is to divide the yield by the number of income-tax payers, charging each the same irrespective of size of income. This would err in the opposite direction. I propose to steer a course between these two extremes and allocate the burden proportionately to total income of the income-tax-paying classes.

The burden calculated in this way and checked for the three



years I am examining works out at almost exactly 1 per cent. of taxable income.

I propose ignoring the land tax because it is an actual instance of any old tax being no tax. I also leave out of account the revenue from defunct taxes because they are arrears not properly assignable to the present year.

I pass now to indirect taxation, and in this sphere I feel obliged to compliment Sir Herbert Samuel and Mr. Caradog Jones on the thorough examination to which they have subjected this form of taxation. They have made the way easy for me. For the most part I accept their measuring rods and have only to take account of changes in consumption or in rates of duty.

#### *Alcohol and Tobacco.*

The consumption per family of alcohol and tobacco can only be averaged. Sir Herbert Samuel based his calculations on the best available information at that time. Several investigators had made enquiries into consumption of typical families with rather unsatisfactory results. The Colwyn Committee calculate average consumption for each income group, in each case separating consumption of males and females. Their conclusions are shown clearly in the Table Relating Direct and Indirect Taxation to Specimen Incomes which I have excerpted for 1918-19 and 1925-26. Incidentally the Colwyn Committee estimate that the consumption of alcohol in the £500 class is actually lower than in the £200 class. I think this is borne out by our observation.

Mr. Caradog Jones states that individual variations of consumption are so great that any system of averaging should be discarded and upper and lower limits assigned. This procedure is certainly desirable in a special study of the lower ranges of income. As I am paying more attention to the higher incomes I am using the older method. I am showing in my final chart the effect of the variations resulting from this treatment. In the figures of revenue I have quoted you will have noticed that the yield from tobacco is increasing and that from alcohol diminishing. This is entirely due to changes in consumption. I am ignoring the slight increase proposed in the beer duty for 1930-31 because it does not affect the taxpayers' burden. This slight increase will rectify an anomaly, for I have it on the authority of a brewer that previously brewers made money out of the tax.

#### *Tea and Sugar.*

The repeal of the Tea Duty in 1929 has had a considerable effect on the burden on lower incomes. The Board of Trade publishes

information on the consumption of sugar which facilitates the allocation of the burden on the different income classes. I propose following my predecessors here. I find that since 1925-26 the imports have been maintained and the tax on foreign sugar has been unaltered. The operation of the Preferential Duty for the Dominions has reduced the yield on the Import Duty. However, I accept Professor Marshall's dictum that wherever differential duties exist, the consumers pay tax at the higher rate and the rebate goes into the pockets of the producers so favoured. I am taking, therefore, the same percentage of income for sugar as the Colwyn Report and Mr. Caradog Jones.

#### *Other Indirect Taxes.*

I do not propose to weary you with a detailed examination of these. Any method of allocation is open to criticism, and I lay down the following arbitrary hypotheses on which I construct my table of the total burden.

#### *McKenna Duties.*

I propose placing the duty on motor-cars on the income-tax-paying classes in proportion to their income, but to spread the other McKenna Duties and the Silk and Rayon Duties over the community proportionately to the average tax burden on alcohol and tobacco. The same extreme variations of consumption do not exist, so I feel fully justified in taking the average here; I am also following this method for Entertainments and the smaller taxes.

This leaves the petrol tax and the £5,000,000 which the Exchequer receives from motor vehicle taxation. I propose treating these in the same way as the yield on motor-cars under the McKenna Duties.

This lumping together of so many taxes and their somewhat arbitrary allocation is open to criticism, but I believe that overlaps will largely cancel out.

I now present my estimate of the total burden on each of the income classes utilized by Sir Herbert Samuel and the Colwyn Committee for the present financial year. I commence at £100 incomes and do not proceed further than the £50,000 incomes. For purposes of comparison I have excerpted the Colwyn figures for 1918-19 and 1925-26 respectively. For the former year they are almost the same as Sir Herbert Samuel's. I further submit a chart I have drawn based on these figures.

You will observe that the chart ends at the £50,000 incomes, and that I have differentiated between earned and investment

incomes, whereas the Colwyn Committee have differentiated between incomes wholly earned and half earned and half investment. Incomes above this sum have to bear a larger burden as Death Duties are graduated beyond this figure. On the excess portion of an unearned income over £50,000 the total rate of 12s. in the pound now applies, and insurance for Death Duties on the Colwyn scale would take more than the remaining 8s. It seems certain that the number of very large incomes will continue to decline unless trade revival of an unexpected and almost unprecedented scale takes place. Diminution of the number of larger incomes and a decline in the incomes themselves certainly secures a more even distribution of wealth, but diminishes the revenue of the country. If the process goes on unabated for a decade, and if no diminution of expenditure takes place and no upward movement of trade comes to the aid of the revenue, it seems likely that resort must be made to greater taxation of the lower levels of income.

The other noticeable feature is the regressive nature of taxation at the other end of the scale, and in particular the comparative smallness of the burden on the £500 income. This has been diminished by the abolition of the Tea Duty. Of course taxation of alcohol and tobacco account for this, and this can be justified on many grounds. Nevertheless, in view of present revenue requirements I feel inclined to suggest that the limit of exemption might be lowered. I agreed entirely with the conclusions arrived at by the Royal Commission on Income Tax in 1920, who fixed the rates of exemption on earned and investment income as follows :—

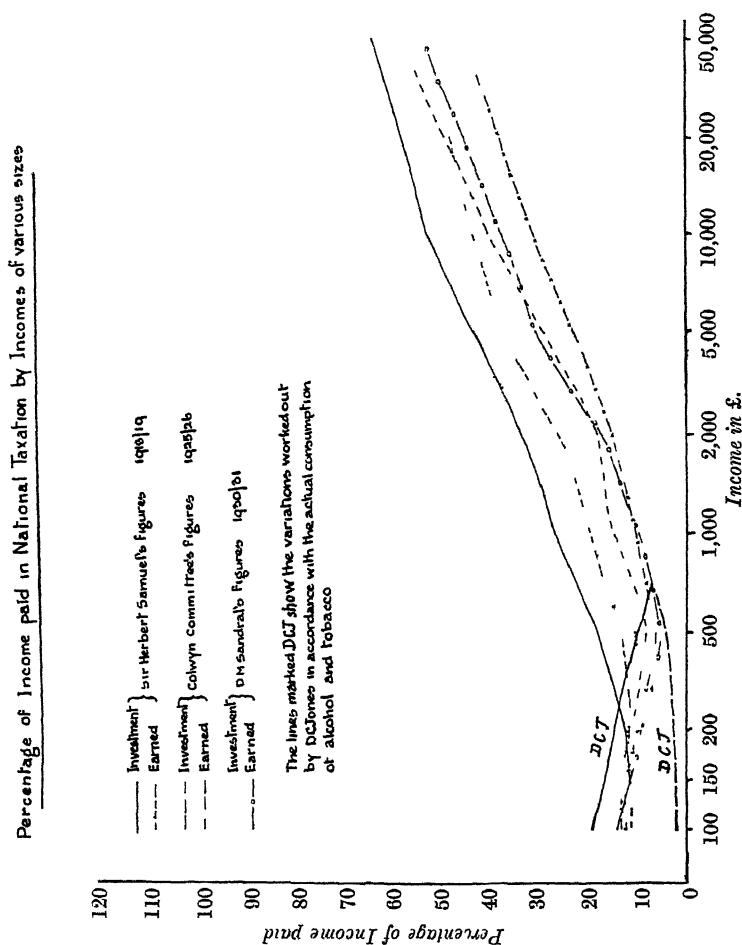
	Unmarried.	Married Couple.
Earned . . . . .	£150	£250
Unearned . . . . .	£135	£225

Since then the amount of differentiation has been increased from  $\frac{1}{10}$  to  $\frac{1}{8}$ . This raises the exemption on earned income to £162 and £270 respectively. The allowances for children have been increased substantially. Further, the Royal Commission recommended the above limits after considering the necessities of the State and the cost of living. Since then the cost-of-living index-number has fallen from say 230 to 157. Applying this index, the exemption limits should now be (allowing  $\frac{1}{8}$  for earned income) :—

	Unmarried.	Married Couple.
Earned . . . . .	£115	£183
Unearned . . . . .	£96	£153

If retail prices fall further, as wholesale prices have done, the present exemption limit will show a further deviation from the

well-reasoned conclusions of this Commission. This Commission recommended "that the limits should be maintained until there was a substantial change in the cost of living and that they should not fluctuate from year to year, but should be altered only at con-



siderable intervals of time." It appears to me that a substantial change has taken place in the considerable interval of ten years which has elapsed.

*Note.*—In reply to a question in the House of Commons, Mr. Snowden gave a table showing that the burden on specimen incomes was lower than the figures given above. The difference is due to the omission by Mr. Snowden of the burden of the Legacy and Succession Duties.

*Relating Direct and Indirect Taxation to Specimen Incomes.*  
*N.B.—The taxpayer is assumed to be married and to have three children under the age of sixteen.*

Income.	Income Tax and Sur-tax.			Death Duties.		Inhabited House Duty.	Total Direct Taxes.		
	Income wholly Earned.		Income half Earned, half Investment.	Income half Earned, half Investment.			Income wholly Earned.		Income half Earned, half Investment.
	£	s. d.		£	s. d.		£	s. d.	
1918-19.*									
100				1 4 0		—	—	4 6	1 4 0
150				1 16 0		4 6	4	6	2 0 0
200				2 9 0		7 6	7	6	2 16 6
500				7 6 0		1 5 0	35	0	51 13 6
1,000	33	15 0	43 2 0	17 14 0		3 0 0	149	5 0	52 14 0
2,000	146	5 0	165 0 0	42 10 0		4 15 0	1 454	15 0	1 923 10 0
5,000	450	0 0	487 10 0	127 0 0		9 0 0	1 492	10 0	1 923 10 0
10,000	1,787	10 0	1,787 10 0	377 10 0		18 0 0	1 492	10 0	1 923 10 0
20,000	4,187	10 0	4,187 10 0	877 10 0		28 0 0	9 455	10 0	10 398 10 0
50,000	9,437	10 0	9,437 10 0	3,826 10 0		55 0 0	25,242	10 0	29,069 0 0
1925 26.*									
100				1 2 0		—	—	—	1 2 0
150				1 11 0		—	—	—	1 14 0
200				2 5 0		—	—	—	2 5 0
500				6 15 0		—	—	—	21 1 8
1,000	10	3 4	14 6 8	17 3 0		—	10	3 4	114 19 8
2,000	81	3 4	97 16 8	64 18 0		—	81	3 4	1346 1 4
5,000	284	10 0	284 10 0	316 3 0		—	284	10 0	1,411 18 0
10,000	1,095	15 0	1,095 15 0	890 17 0		—	1,095	15 0	3,880 12 0
20,000	2,995	15 0	2,995 15 0	2,353 18 0		—	2,995	15 0	9,924 13 0
50,000	7,370	15 0	7,370 15 0	6,021 18 0		—	7,370	15 0	28,742 13 0
	22,120	15 0	22,120 15 0				22,120	15 0	
Income.	Income Tax and Sur-tax.			Death Duties.		Stamps.	Total Direct Taxes.		
	Income wholly Earned.		Income half Earned, half Investment.	Income half Earned, half Investment.			Income wholly Earned.		Income half Earned, half Investment.
	£	s. d.		£	s. d.		£	s. d.	
1930-31.†									
100				2 2 0		—	—	—	2 2 0
150				3 3 0		—	—	—	3 3 0
200				4 4 0		—	—	—	4 4 0
500				16 17 0		—	—	—	20 16 0
1,000	3	8 4	11 10 0	50 17 0		1 11 0	4	14 4	174 9 6
2,000	69	12 6	107 2 6	210 0 0		7 10 0	77	2 6	262 2 6
5,000	275	17 6	332 2 6	526 0 0		20 0 0	1,307	2 6	2,583 7 6
10,000	1,257	2 6	3,513 7 6	920 0 0		100 0 0	3,557	2 6	6,179 7 6
20,000	3,457	2 6	8,682 7 6	2,563 0 0		200 0 0	8,782	2 6	16,301 7 6
50,000	25,582	2 6	25,638 7 6	32,310 0 0		500 0 0	26,082	2 6	58,467 7 6

\* Excerpt from Report of Colwyn Committee.

† Drawn up by D. M. Sandral.

*Relating Direct and Indirect Taxation to Specimen Incomes.—Contd.*  
*N.B.—The taxpayer is assumed to be married and to have three children under the age of sixteen.*

Income.	Tea.		Sugar.		Tobacco.		Alcoholic Drinks.		Entertainments.		Cocoa, Coffee and Chicory, Dried Fruits, Patent Medicines and Table Waters.		Total Indirect Taxes.
	£.	s. d.	£.	s. d.	£.	s. d.	£.	s. d.	£.	s. d.	£.	s. d.	
1918-19.*													
100	1	8 0	2	14 0	2	5 0	2	15 0	5	6 6	10	0 0	17 6
150	1	12 0	3	1 0	3	6 0	4	5 0	7	0 0	11	6 6	18 6
200	1	15 0	3	5 6	4	2 0	5	5 0	11	6 6	14	0 0	19 0
500	1	15 0	3	6 6	4	9 0	7	10 0	17	0 0	15	0 0	20 3 6
1,000	1	15 0	3	6 6	6	13 0	11	15 0	1	10 0	15	0 0	25 14 6
2,000	1	15 0	3	6 6	8	3 0	20	0 0	2	10 0	15	0 0	35 19 6
5,000	1	15 0	3	6 6	9	0 0	36	0 0	2	10 0	15	0 0	63 0 6
10,000	1	15 0	3	6 6	9	0 0	36	0 0	2	10 0	15	0 0	63 0 6
20,000	1	15 0	3	6 6	9	0 0	36	0 0	2	10 0	15	0 0	63 0 6
50,000	1	15 0	3	6 6	9	0 0	36	0 0	2	10 0	15	0 0	63 0 6
1925-26.*													
100	11	0 0	1	17 6	2	15 0	6	5 0	3	0 0	6	0 0	11 17 6
150	12	0 0	2	3 9	4	16 0	10	3 0	4	0 0	6	6 6	17 19 3
200	12	0 0	2	5 3	5	0 0	12	0 0	5	0 0	6	9 9	20 7 9
500	12	0 0	2	7 6	6	0 0	12	0 0	12	0 0	6	9 9	20 19 0
1,000	12	0 0	2	7 6	7	6 0	18	0 0	1	0 0	6	9 9	40 0 0
2,000	12	0 0	2	7 6	7	6 0	23	0 0	1	12 0	6	9 9	65 5 0
5,000	12	0 0	2	7 6	9	13 0	50	0 0	2	15 0	6	9 9	121 6 0
10,000	12	0 0	2	7 6	10	4 0	105	0 0	2	15 0	6	9 9	121 6 0
20,000	12	0 0	2	7 6	10	4 0	105	0 0	2	15 0	6	9 9	121 6 0
50,000	12	0 0	2	7 6	10	4 0	105	0 0	2	15 0	6	9 9	121 6 0
Income.	Alcohol.		Tobacco.		Sugar.		Petrol and Motor-Cars.		Other Indirect Taxes.		Total Indirect Taxes.		
	£.	s. d.	£.	s. d.	£.	s. d.	£.	s. d.	£.	s. d.	£.	s. d.	
1930-31.†													
100	5	12 6	3	0 6	1	17 6	—	—	9	0 0	10	19 6	
150	9	3 0	4	8 0	2	3 9	—	—	18	6 6	16	8 3	
200	10	19 0	5	4 6	2	5 3	—	—	16	0 0	19	4 0	
500	10	16 0	5	10 0	2	5 3	1	5 0	16	0 0	20	15 0	
1,000	16	4 0	7	8 6	2	7 6	1	5 0	1	3 0	22	3 0	
2,000	25	4 0	8	5 0	2	7 6	16	0 0	2	13 6	23	10 0	
5,000	45	0 0	10	12 0	2	7 6	40	0 0	6	15 6	100	15 0	
10,000	104	10 0	11	4 0	2	7 6	80	0 0	6	15 0	203	16 6	
20,000	104	10 0	11	4 0	2	7 6	160	0 0	5	15 0	283	16 6	
50,000	104	10 0	11	4 0	2	7 6	400	0 0	5	15 0	523	16 6	

\* Excerpt from Report of Colwyn Committee.

† Drawn up by D. M. Sandral.



## REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Frisch (Ragnar)*: *Correlation and Scatter in Statistical Variables*. *Nordic Statistical Journal*, 1929, Vol. I. 9½" × 6½", 36–102 pp.

The *Nordisk Statistisk Tidskrift*, begun in 1922, is to be congratulated on its recent decision to publish an edition in English, under the name of the *Nordic Statistical Journal*. The Journal is published quarterly, the four numbers making a volume of about 640 pages. The first volume contains an important long paper by Ragnar Frisch, who is already well known for his writings on some of the fundamental problems of theoretical statistics. This paper is particularly interesting because of the powerful use that has been made of vector and matrix analysis. To put it briefly, the  $n$  quantitative attributes  $z_1, z_2, \dots, z_n$  of a statistical observation are interpreted as the components of a vector  $\mathbf{z}$ , and if each observation is represented by a point in  $n$  dimensions, we obtain for a given sample a swarm of observation points called the *scatter diagram*. The set is called  $\mathbf{x}$  when the variables are measured from their means. The product moments (taken about the means), and including the product of each attribute with itself, are then regarded as forming a symmetric matrix  $\mathbf{M}$ , called the moment matrix of the set. There is equally a correlation matrix  $\mathbf{R}$  made up of the correlation coefficients of the attributes, one with another. At this point the author defines the



collective scatter coefficient as  $s = +\sqrt{R}$ , where  $R$  is the determinant of the matrix  $\mathbf{R}$ , and the collective correlation coefficient as  $r = +\sqrt{1 - R}$ . The significance of the collective scatter coefficient is seen by taking in all possible ways  $n$  points out of the total aggregate of  $\omega$  observations in  $n$  dimensions, together with an  $(n + 1)$ th point, the mean, and determining the volume of the "corner" formed by joining up these points. If the  $\omega$  points are rigorously lying in a plane these volumes will all be zero. Let  $\sigma^2$  be defined as the average value of all these volumes. Then  $\sigma$  is called the *collective standard deviation* in the set, and a relative measure of the lack of linearity in the set is obtained by finding the ratio of  $\sigma$  to the product of the  $n$  standard deviations for the  $n$  attributes. This ratio is nothing else than the scatter coefficient  $s$  already defined. A further definition is the *coefficient of linear importance*. If we form the adjoint correlation matrix  $\hat{\mathbf{R}}$ , i.e., the matrix which is formed by replacing each element in  $\mathbf{R}$  by its cofactor in  $R$ , then the coefficient of linear importance of  $x_i$  in the set  $\mathbf{x}$  is defined as  $+\sqrt{\hat{r}_{ii}}$ . Certain propositions are demonstrated about the values of  $R$  and the coefficient of scatter, and we then come to the study of correlation in general, and of orthogonal transformations. It is shown that the  $n$  effective variables  $x_1 \dots x_n$  are uncorrelated when and only when the coefficient of scatter  $s$  is equal to 1, and also that any set of statistical variables can be reduced to an uncorrelated form by means of a non-singular linear transformation.

In a section on regression equations it is first shown how the  $n$  elementary regressions are conveniently expressed in matrix notation in the form  $\mathbf{M}\mathbf{x} = 0$ . The author is then careful to state that "since the  $i$ th elementary regression is the regression obtained by minimizing the deviations from linearity, measured in the  $x_i$  direction, it can be looked upon as the regression obtained by attributing the actual lack of agreement with the postulated analytic relation, exclusively to the variation of  $x_i$ ," and that the difference between these regressions therefore involves a difference of assumption regarding the nature of the variability of the variables involved. He criticizes the investigator who has some special reason for being attracted to the variable  $x_i$  and who therefore picks that variable out to exhibit its dependence on the others without formal justification. He emphasizes that "the choice of regression essentially represents a problem by itself, and should not be confused with the choice of a particular form in which to write the regression chosen." In many cases, particularly in the economic field, none of the regressions can be accepted as plausible, and it is often out of the question to treat the variables unsymmetrically to the extent of attributing all deviations from linearity to one particular variable. The author considers that what is wanted in such cases is some kind of *mean regression plane*, and he presents two alternative forms, the *orthogonal mean regression*, obtained by minimizing the sum of squares of deviations measured perpendicularly to the plane, and secondly, the *diagonal mean regression*, which is a function of ~~the~~ coefficients of linear importance.

Going on to consider the problem of invariance, the author shows that the orthogonal mean regression is invariant for translation, *i.e.*, a change of origin, and for a general orthogonal transformation, while the diagonal mean regression is invariant for translation and also for stretch, *i.e.*, a change of scales. He then considers the problem where we have no absolute *a priori* criterion to guide us in the choice of variables, as, for example, in the case of a differential analysis of time series. He states that what we want in this type of problem is a mean regression plane which is invariant for a homogeneous linear transformation of the variables measured from the origin. He furnishes a solution for this problem in the form

$$\begin{vmatrix} 0 & x_1 & \dots & x_n \\ k_1 m_{11} & \dots & m_{1n} \\ \dots & \dots & \dots & \dots \\ k_n m_{n1} & \dots & m_{nn} \end{vmatrix} = 0$$

where  $k_i = \sum_t z_i(t)$  is the sum of all the observed values of the variable  $z_i$ . He instances in this connection unpublished work of a similar character done by C. F. Roos and A. Oppenheim in America.

The final section of the paper is concerned with the general problem of correlation among the  $n$  variables. For more than two variables we have to distinguish between different types of clustering in the  $n$ -dimensional scatter diagram. "For three variables it might happen that the swarm of observation points in the three-dimensional scatter diagram is clustering around a plane through the origin, but is highly scattered within this plane. The plane may be far from containing any of the axes. Or it may be a plane containing the  $x_1$  axis, that is, a plane perpendicular to the  $x_2 x_3$  plane. Again, it might happen that the swarm of observation points is clustering not only around a plane but even around a straight line in this plane. For several variables the number of different cases is, of course, much greater. And each one of these various cases has a very definite significance." He goes on to say that a rigorous analysis of these various cases is usually neglected, and criticizes the mechanical use of computation formulæ without previous consideration of this important point. The classical correlation parameters become undefined in those cases of linear dependency which illustrate the various types of clustering, while the scatter coefficient and the coefficients of linear importance always preserve a sense. He establishes a number of propositions which prepare the way for a system of procedure in the practical problem. Thus: "a necessary and sufficient condition for a set  $x$  to be simply collinear is that  $R = 0$  and that at least one of the diagonal elements  $\hat{r}_{ii}$  in the adjoint correlation matrix  $\hat{R}$  is different from zero." "A necessary and sufficient condition for a set  $x$  to be a closed set is that  $R = 0$ , and all the diagonal elements  $\hat{r}_{ii}$  of the adjoint correlation matrix are different from zero." In this connection sampling theory becomes of importance, because for a rigorous analysis it will be necessary to find the distribution in random samples of the statistics  $R$  and  $\hat{r}_{ii}$  in order to determine whether in any given case

the parameters are significantly different from zero or not. The author has not solved this problem, but we may anticipate that a solution could be reached without difficulty, at any rate in an approximate form, since the distribution of the multiple correlation coefficient is now known. The author asserts that his criteria enable us to distinguish cases where some of the variables stand entirely outside the linear relationship which it is sought to determine, and where, therefore, certain of the regression coefficients can have no meaning. He believes that the mere computation of partial and multiple correlation coefficients is insufficient to distinguish such cases. His method of procedure is to calculate the simple correlation coefficients and hence the scatter coefficient. If this latter is reasonably close to unity the diagonal elements  $\hat{r}_{ii}$  of the adjoint correlation matrix are to be computed. Any variable  $x_a$  for which  $\sqrt{\hat{r}_{aa}}$  is small should then be left out and the remainder treated as a closed set, or at any rate the regression of any of the  $x_a$  on the other variables should not be computed. The necessary work for calculating all the partial regression equations has thus been carried out, and it is not clear whether the criteria suggested by the author convey more information than would be afforded by the regression coefficients themselves, which would indicate when certain of the variables were extraneous. The investigator usually knows from the nature of his problem which of his variables is to be regarded as the dependent variable, and there is usually only one such variable. The point is, however, commended to the attention of mathematical statisticians.

J. W.

2.—*The Genetical Theory of Natural Selection*. By R. A. Fisher, Sc.D., F.R.S.  $9\frac{1}{4}'' \times 6\frac{1}{4}''$ . xiv + 272 pp. Oxford University Press, 1930. Price 17s. 6d. net.

Dr. Fisher's thesis is that the theory of Natural Selection has been so fully identified with its rôle as an evolutionary agency that it has suffered neglect as an independent principle worthy of scientific study. That, although Natural Selection is not Evolution, yet, ever since the two words have been in common use, the theory of Natural Selection has been employed as a convenient abbreviation for the theory of Evolution by means of Natural Selection, put forward by Darwin and Wallace. "This has had the unfortunate consequence that the theory of Natural Selection itself has scarcely ever, if ever, received separate consideration." Such an independent study is now possible owing to the great advance which the present generation has seen in the science of genetics; for, when the theory was first put forward, the principle of inheritance was the vaguest element in its composition. The revolutionary effect of Mendelism flows from the particulate character of the hereditary elements, and it is on this fact that a rational theory of Natural Selection can be based. The assumption, before the recognition and acceptance of Mendelism, of the blending theory of inheritance leads to the great difficulty that "if not safeguarded by intense marital correlation, the heritable variance is approximately halved in every generation. To maintain a stationary variance fresh mutations must be available in each generation

to supply the half of the variance so lost. . . . Almost every individual of each generation must be a mutant." With particulate inheritance there is no such inherent tendency for the variability to diminish, and, therefore, "the mutation rate needed to maintain a given amount of variability is many thousand times smaller than that which is required on the blending theory." Accepting, thus, the assumption of particulate inheritance, Dr. Fisher, in the first seven chapters of his book, applies a close mathematical and statistical reasoning to the evolutionary process by means of Natural Selection as illustrated by the problems of adaptation; the evolution of dominance (his theory of which appears to throw considerable light upon the nature of mutations, and on the intensity of adaptation); variation as determined by mutation and selection—a detailed examination of the method by which, according to the genetic theory of Natural Selection, new genes arise, prevail or become extinct; sexual reproduction and sexual selection (which chapter includes an interesting paragraph on sex-ratio); and mimicry, the evolution of distastefulness, and similar questions. The larger part of these chapters demands from the reader not only a considerable knowledge of genetics but a considerable knowledge of mathematics. In fact the author himself in his preface says, "no efforts of mine could avail to make the book easy reading." From Dr. Fisher this is no mean threat: anyone at all conversant with his scientific works knows that they are invariably difficult to read—though equally invariably exceedingly well worth the effort demanded. In this case he has endeavoured to assist the reader by giving short summaries at the end of each chapter, while within the text there is much to interest those who are quite unable to follow the mathematical statistical methods. It would be a pity if these difficulties should deter readers from attempting the book at all, for the final five chapters, devoted to man, are quite non-technical, and, although the author says "are strictly inseparable from the general chapters," can certainly be read with profit apart from the rest of the book. A clear and continually interesting discussion of the social evolution of man, of the inheritance of human fertility and the social selection of fertility, leads the author to a theory of the decay of civilizations. This he traces to the inversion of the birth-rate—"the peculiar situation in which the more fortunate and successful of mankind have the smallest birth-rate." Whereas in "barbarian" societies the more eminent members were, it seems, the more prolific in civilized societies just the reverse is to be seen, so that there exists a continual degeneration or depletion of the ruling classes. "The type of man selected, as the ancestor of future generations, is he whose probability is least of winning admiration, or rewards, for useful services to the society to which he belongs." The dysgenic features of the situation may be expressed by saying that they are implied by the existence of a differentiation of social class in which social promotion is determined by the combination of two different attributes—(1) socially valuable qualities, and (2) infertility. In this problem of the decay of the ruling classes Dr. Fisher thinks that neither race-mixture nor the

selective action of climate and disease would suffice to explain their failure under favourable selection. The causes to which he traces the inversion of fertility, viz. the inheritance of the characters determining reproduction and the social promotion of the less fertile, must, on the other hand, have been operative in the most ancient civilizations. The condition of the Roman Empire was certainly similar to that observed in modern countries. In all societies so constituted there seems to be an absolute failure of the economic system to reconcile the practice of individual reproduction with the permanent existence of a population fit, by their mutual services, for existence in society.

In his final chapter Dr. Fisher discusses whether this failure can be counteracted, his conclusions being that a moderate social promotion of fertility is not incompatible with our economic organization, but that the French system of family allowances is definitely inadequate to preserve the higher levels of intellectual ability. "The composition of existing populations, graded both in social ability and effective infertility, presents special and much graver difficulties which only a people capable of deliberate and intentional policy could hope to overcome."

"And nothing 'gainst time's scythe can make defence  
Save treed to brave him when he takes thee hence."

A. B. H.

3.—*Les Causes du Suicide*. By Maurice Halbwachs. 9" × 6". viii + 520 pp. Paris: Librairie Félix Alcan. 1930. Price 70 fr.

As a statistical study this rather too solid fare is not likely to supersede the detailed analysis made a few years ago by Dr. John Rice Miner ("Suicide and its Relation to Climatic and other Factors," *American Journal of Hygiene*, Monographic Series, 1922). Professor Halbwachs discusses suicide from many points of view—its geographical distribution in Europe, and within various European countries, in towns and in rural areas; its relationship to such factors as civil state, religion, homicide, war, political and economic crises; and its pathological and social aspects. A considerable amount of information bearing on these factors is set out in his tables and the discussion is often interesting, but the statistical treatment of the data is meagre. The author prefers to use a "coefficient of dispersion" (100 times the mean deviation) instead of the standard deviation, and to calculate the correlation between two variables by a particular method of ranking. ("If we place a certain number of countries in two series, here, for example, according to the increasing density of their population and the increasing frequency of their suicides, they can all occupy the same rank respectively in the two series. The mean deviation between the two rankings is then equal to 0, which represents the coefficient of maximum correspondence. If the ranks which they occupy in the two series are as different as possible, the mean deviation is equal (or is only less by a small fraction) to the half of the number of the countries: that is, the coefficient of maximum opposition. When the mean deviation is equal to the half of this last coefficient (or to a quarter of the number of the countries)

we shall say that there is not any relationship between the two rankings: that is, the coefficient of independence." (Footnote, p. 170.) These methods, naturally, do not facilitate comparison with other material, while, in addition, one cannot help feeling that the salient facts could have been set out, perhaps more clearly, in less than 500 pages. In a book of this size the addition of an index would be an obvious advantage.

Amongst his many other facts the author shows that during a period of eighty years (1834-1913) in most European countries there has been a considerable rise in the death-rate from suicide. On the other hand, before the end of this period most countries seem to have reached a maximum, and their rates appear to have become stabilized. The variation between countries, and between districts in the same country, has, at the same time, become very much reduced. For instance, in England the variation between the rates in eleven groups of counties has fallen from (relative numbers) 100 in 1861-70 to 52 in 1920-26 (as measured by the author's "Coefficient de dispersion pondéré"). Suicides, as one would expect, are proportionally more numerous in large towns, but, even in this case, the neighbourhood of such large towns seems to affect adjacent districts, and tends to level up the rate for the surrounding area.

The rate of suicide fell considerably during the Great War both in belligerent and in neutral countries. Professor Halbwachs discusses this phenomenon at some length, and concludes that at least a great part of the explanation lies in the "simplification" of life at such a period. "War multiplies the barriers between nations, and, at the same time as it harmonizes men of the same nation, it separates them one from another in many ways. Not only is economic and professional activity partly paralysed, but families, deprived of a part of their members, show a diminished vitality. There is less opportunity for association between individual and individual, and the occasions for strife and conflict offer themselves less frequently. . . . It is not so much the rhythm of collective sentiments and passions as the decreasing complexity of life and the increasing simplicity of the social structure which show their effects in time of war in the movement of suicide rates" (p. 327-28).

A. B. H.

4.—*Statistics in Social Studies*. Edited by Stuart A. Rice for the American Statistical Association. 8½" × 5½". xii + 222 pp. University of Pennsylvania Press; London: H. Milford. 1930. Price 12s. 6d. net.

At its annual meeting in 1925 the American Statistical Association appointed a Committee on Social Statistics, the original concern of which was mainly social welfare statistics. In 1929 this Committee aimed at an expansion of its interests, concluding that there was a "need of an appraisal of the extent to which statistical methods" had been developed and utilized in a large variety of social and sociological studies. Accordingly, a series of joint meetings were arranged between the American Statistical Association and the American Sociological Society. Contributors were asked

to direct their discussions to questions relating to statistical *method* rather than to results. The papers published in this book, to which there are twelve contributors, were the outcome of these joint meetings. The subjects dealt with are marriage and the family, health and medical care, dependency, race relations, crime, judicial statistics, prohibition, social attitudes and public opinion, and personality and personality maladjustment. The Committee had some hesitation in including prohibition upon its programme owing to the subject being so highly controversial and the difficulty of finding "a competent statistician, familiar with research in the field, who was at the same time in a position of neutrality before the public with respect to it." As a solution it was decided to procure papers from statisticians who would be recognized as partisans on opposite sides of the wet and dry controversy. The English reader will probably find these three papers some of the most interesting, although he will remain just as unenlightened as to the success or failure of prohibition; but the statistical evidence of the "wet" contributor (J. C. Gebhart) certainly wilts under the attacks of the "dry" (H. Feldman and Irving Fisher, who incidentally disclaim any partisanship).

The other contributions to the book are somewhat uneven in value. For instance, that on Health and Medical Care (H. Carter) deals nearly entirely with the cost of medical treatment (medical attendance, hospitalization, prescriptions), and the only reference to morbidity statistics is the pious hope that the "arrival of comprehensive, official, morbidity statistics" will be hastened. No attention at all is paid to the difficulties of securing and interpreting such statistics.

The papers dealing with crime and judicial statistics are of less interest to the English than to the American reader, for it is the latter who has to cope with the variation of state laws and procedures. The Editor contributes an interesting discussion of the statistics of social attitudes, and an elaborate method of reducing them to a scale of values.

As a whole the book is likely to be of more value to the social worker about to adopt statistical methods in his particular field than to the trained statistician—which was probably its aim.

A. B. H.

5.—*The Economics of Inheritance*. By Josiah Wedgwood, B.Sc. (Econ.). 8½" × 5½". xviii + 276 pp. London: Routledge, 1929. Price 12s. 6d.

Mr. Wedgwood is not impressed by current arguments in favour of maintaining inequalities of wealth, but considers that probably our community could achieve a higher standard of productivity, and certainly of happiness, if even at the risk of a substantial decline in capital accumulation, it devoted more of its resources to improving the environment and quality of its people. There remains, however, the argument that certain institutions that are desirable in the interests of productivity, inevitably create as a by-product great inequalities of income. "We need to analyse the causes of unequal

distribution, and to decide which factors are the most important and which can be modified or eliminated without directly or indirectly checking productive effort," and "the present work aims at contributing to such an analysis by selecting one particular factor—Inheritance—and endeavouring to answer the following main questions about it:—In what ways and to what extent does it cause inequality? Is the institution in its present form desirable in the interests of productivity? If not, how should it be modified?"

The opening chapters discuss "the ways in which the inheritance of property aggravates and perpetuates inequality both of "earned" and "unearned" incomes, and the modifying effect on its influence of different laws of inheritance and of varying social and economic conditions." Topics such as the comparative effects of freedom of bequest and the *legitim*, charitable bequests, the distribution of inherited wealth, marriage, the relative size of families and general economic conditions are discussed in detail with a greater wealth of statistical illustration than usual. Then follows a hazardous estimate of the relative proportions of the national capital due to inheritance and saving, which, according to the author, work out at two-thirds and one-third respectively. A valuable and interesting feature of the book is the result of the author's sample investigations into the fortunes of parents and children. The first comprised 99 English estates in excess of £200,000 left during the year 1924, and the second 124 estates between £10,000 and £200,000 passing in a few weeks of 1926, and from these it is concluded "that only a minority of wealthy men have built up their capital without the aid of inheritance, that the large fortunes of women are almost entirely due to inheritance and marriage, and that it is difficult and comparatively rare for poor men to acquire much property by their own activities within their own lifetime."

The difficult question of the distribution of inherited property and savings receives adequate treatment so far as the unsatisfactory nature of the data allows. "It is significant that the relative distribution of property is very similar at all ages from thirty-five onwards," and "that the average estate of all classes within the richest tenth of the people increases up to the most advanced age, but at a much slower rate after sixty or so, while after that age, among the poorer classes, actual decumulation can be observed."

The final portion of the book, which deals with such topics as the justification of inheritance, equalisation of inheritances by taxation, the problem of evasion, taxation of gifts *inter vivos* and recent proposals for the reform and extension of the death duties, is free from partisanship, and reflects much credit upon Mr. Wedgwood's powers of economic analysis.

Whilst Mr. Wedgwood utilizes his statistical material with judgment and skill, he fails to bring out its inherent limitations as a basis for economic inference. What is the relationship between (a) nominal ownership of wealth or titles to wealth, (b) actual control of wealth, and (c) power to reduce that wealth into personal enjoyment? And even though one refuses to go behind legal titles, and insists



upon ownership as the significant test, what then is the relationship between the recorded value of a fortune and its present value as represented by discounted income, less discounted costs of upkeep? When in addition account is taken of the continual depletion of large fortunes due to capital taxation, and the risks incurred by their owners with respect to capital depreciation, one is left with a problem that transcends our powers of analysis. It is clear, however, that beneficial income from wealth is more equably distributed than nominal income, and that inheritance is a less significant factor in economic life than a study of the crude figures would lead one to suppose.

L. R. C.

6.—*The Economic War*, by George Peel. 8½" + 5¼", vii + 284 pp. London: Macmillan and Co., Ltd., 1930. 10s. 6d. net.

This is not a statistical work and, therefore, does not call for a detailed and critical review here. Statistics, however, are not an end in themselves, and one of the purposes of industrial statistics is to provide the foundation on which a sound structure of reform or reconstruction can be built. That is true, although Mr. Peel remarks that "even statisticians are sometimes rhetoricians also. There are innuendoes even in index-numbers: and even algebra may conceal an animus." Incidentally, the repetition of "even" is not good rhetoric, and other nations may jib at the peroration: "Britain seeks the prosperity of all. Her march is on the world-wide waters. Her industrial watchword is association, not ascendancy. And the crown of her glorious career will be to secure, for her own and for all peoples, the economic co-ordination of the world." Such "cloud-capped towers and gorgeous palaces" of economics do not represent the book fairly, which is a shrewd and, occasionally, biting analysis of the industrial and commercial situation of to-day. Some "reformers," indeed, growing old, may smile reminiscently at finding their once red-hot phrases reproduced by one who cannot be suspected of socialist bias. Broadly speaking, Mr. Peel holds that "the combined forces of Economic Theory, of Taxation, of Social Provision, and, finally, the new, but fundamental, interests of Organised Labour itself—all these elements are in active operation to cut away the roots of those grievances which Labour has historically entertained against Capital." This phase of the "Economic War" being a "declining factor of disturbance," the author next considers "the widening war" of agricultural and industrial nations with each other. "Upon the progress or decline of our great export industries turns our victory or failure in the Economic War," and therein he agrees with Sir Basil Blackett that "tariff questions are neither central nor dominating." The real need is, as the Balfour Committee said, that our export industries should "subject their organisation and equipment to a thorough process of reconditioning."

Emphatically this is a book to be read, and read carefully. When it has been read, the reader would then do well to see how far trade and industrial statistics support or oppose the author.

H. W. M.

7.—*Account Rendered, 1900-1930.* By Sir Ernest Benn. 8½" × 5½". 234 pp. London: Ernest Benn, Ltd. 1930. Price 6s.net

Sir Ernest Benn sets himself, as the sub-title states, "to estimate the moral and material cost of the new ideas expressed in the political activities of Great Britain" during the last thirty years. He is an unrepentant Victorian; he questions the value of twentieth-century legislation, and asserts that taxpayers and ratepayers do not get value for their money. Some of his calculations may be criticized; he asserts that the amount of the bill that we have to hand on to posterity, as a direct result of our post-war actions alone, is far heavier than the whole cost of the war, and that since 1883 the debt per head (national and local) has grown from £18 to £500. Unlike most writers and speakers on the present trade depression, Sir Ernest allows little influence to the question of money or currency; he insists that it is not the scarcity or abundance of money that matters so much as the solid things—"the iron, cloth, paper or hats—which alone are responsible for a good or bad standard of living." In actual daily practice we pay for what we receive with the goods we make or the services we perform. He goes on to say that foreign trade has less importance than we are led to think; our home trade "can be expanded almost without limit if we want to work."

As a practical illustration he writes: "Currency control may alter the price level a few points, but a State housing scheme can double the price of a house." Possibly statisticians will not quarrel with Sir Ernest Benn when he declares that Unemployment Insurance is no longer insurance at all. He estimates the country's liability for unemployment benefit at not less than £200 millions. He maintains that the accounts of the Insurance Fund are made up, "as the State makes up all its accounts, without any true actuarial or accountancy basis." Sir Ernest reckons that pensions, national and local, required £20 million in 1914 and now require £115 million, a figure which will grow automatically because salaries are higher. But why does he capitalize this figure at thirty-three years purchase? The taxpayer suffers from the fact that the non-working life is being lengthened at both ends—a later age for school leaving and an earlier age for pensions.

Although he is convinced of the need of economy in national and local affairs, Sir Ernest sees little hope of it; his view is confirmed by the action of the House of Commons in allowing the economy discussion to be counted out at 8.15 p.m. on December 9. The expenses of departments grow automatically. It appears that Somerset House required just over £3 million in 1917-18, or .06 per cent. of the revenue collected; in 1928-9 the cost was £7½ million, or 1.7 per cent. As an instance of growing and expensive activities on a small scale, Sir Ernest takes the Ministry of Agriculture, which cost £264,000 in 1913-14, and £2,953,000 in 1929-30. On a larger scale he calculates that it costs £79 million to educate 10 per cent. less children than were taught for £30 million sixteen years ago. Much larger figures are required for the social services, which cost us £22.6 million in 1891, £68 million in 1911, and £383 million in 1927.

In the Dominions Sir Ernest finds the same spirit of extravagance. He begs us to take warning from the example of Australia, where the debt has grown since the war from £325 million to £542 million. He even doubts the advantages of the Commonwealth or of federation. Having spent some time as a departmental chief in the Ministry of Reconstruction, Sir Ernest feels able to criticize the Civil Service from inside; he doubts if most of the work done by Civil Servants is worth doing. As an example of bureaucracy at its worst he quotes the Agricultural Marketing Bill, which he prints in full as an Appendix.

An interesting chapter gives the financial history of Godstone, a rural district twenty miles from London, during the last 30 years. On February 1st, 1901, its debt amounted to £906; on March 31st, 1929, the debt was £369,000. Even since 1913 the annual expenditure has grown from £36,000 to £118,000, although the population decreased, through the loss of Caterham, from 34,158 to 24,696. Only one official now holds his 1913 post, but his salary has risen from £250 to £750. Of course Sir Ernest admits that we get some return for all this expenditure; his case is that we do not get good value for our money and that we cannot afford to pay so much. Modern legislation aims at levelling up; in Sir Ernest Benn's opinion it succeeds only in levelling down.

J. E. A.

8.—*The National Income and its Purchasing Power*. By Wilford Isbell King, assisted by L. Epstein. 9" × 6". 394 pp. New York: National Bureau of Economic Research Incorporated, 1930. Price \$5.

This is a development and continuation of previous studies, and carries the reader as far as the year 1928.

The purchasing power (expressed in 1913 dollars) of the estimated *realized* income of the people of the United States was \$35,756 million in 1913 and \$54,022 million in 1928. The latter figure included \$20,725 million money and commodity income of entrepreneurs and property-owners, \$3,330 million *imputed* income and \$29,967 million representing the share of employees. *Realized* income is "that part of the income of individuals which remains if we eliminate income due to changes in values of inventories or property of any kind," and *imputed* income represents the estimated value of the services rendered by durable consumers' goods.

The results achieved in the principal industries are studied in detail, and a new section is included dealing with the value of corporations to their owners.

Every available source of information has been utilized, and every effort has been made to secure reliability and consistency. The accompanying tables and charts are excellent. It would have been better, however, if the authors had given details showing how their estimates had been built up.

L. R. C.

9.—*Real Wages in the United States, 1890–1926.* By Paul H. Douglas, Professor of Industrial Relations, the University of Chicago. 8½" × 5¾". xxviii + 682 pp. Boston and New York: Houghton Mifflin Company. 1930. Price \$7.50.

This volume forms Number Nine of the publications of the Pollak Foundation for Economic Research. In a preface we are told that Professor Douglas devoted the major part of his energies for six years to the preparation of this volume, and even a hasty glance through it is sufficient to show that a very considerable amount of work and thought must have been involved. The volume sets out to trace for the thirty-seven years, 1890–1926, the economic progress of the people of the United States who work for wages or salaries. This group comprises nearly twenty-seven million workers upon whose earning depends the economic welfare of seventy million people.

The first part of the volume deals with movements in the cost of living from 1890 to 1926 so as to provide a measure to apply to changes in wages and earnings, with a view to arriving at "real wages." Part II is concerned with rates of wages and hours of labour in various groups of industries, leading up to the consideration of full-time weekly earnings in industry as a whole. In Part III the study is extended to the actual earnings per annum of employed workers, while Part IV takes unemployment into account and contains estimates for each of the years 1890–1926 of annual real earnings, *i.e.*, after applying the cost-of-living factor.

The difficulties attending the compilation of figures relating to thirty-seven years may be appreciated when it is known that for neither cost of living, rates of wages nor annual earnings are there any continuous records covering the whole series of years. In the case of cost of living, for example, the records for the years 1890–1914 compiled by the U.S. Bureau of Labour Statistics show changes in the number of commodities for which price quotations were obtained and changes also in methods of computation. Professor Douglas has investigated these changes thoroughly and has made reasoned adjustments so as to secure a range of figures as comparable as is possible. After 1914, however, the cost-of-living statistics included the item of rent, which was absent from the figures for earlier years. An investigation made by the Bureau of Labour relating to the year 1901 showed that food, clothing, fuel and light, furniture and furnishings, liquor and tobacco comprised 68 per cent. of the expenditure of working men's families while rent accounted for another 18 per cent. But Professor Douglas has apparently joined the later series (including rent) to the earlier one (excluding rent), and one is left wondering why, having discussed and dealt with the trouble, in the earlier series of figures, of the appearance in the food bill of pork chops and poultry in some years and not in others, he should have made no adjustment in the case of such an important item as rent.

For rates of wages the data consisted of union rates for some industries and earnings derived from pay-rolls in others. After the year 1914 the pay-roll figures tended to be collected once in two

years, and the problem arose of estimates of the probable course of earnings during years for which statistics were not available. Several experiments were made by Professor Douglas. "One was the method of straight-line interpolation, in which one assumed equal absolute quantities of change during the intervening year or years. Another was to estimate the changes in the so-called pay-roll industries by the relative changes in the union industries. Both of these methods were found to be defective. The one finally adopted was that of using the relative fluctuation of actual weekly or yearly earnings in the given industry . . . to determine the probable fluctuation in the hourly earnings." And he proceeds to discuss the margin of error involved in the estimates. The above extract affords an illustration of the care taken at each step to keep the reader fully informed.

The principal data for the compilation of the record of earnings per annum consisted of the census statistics. But these related to the quinquennial censuses from 1889 to 1919, and thus there were gaps to be filled by interpolation. (From 1919 onwards the census inquiries into earnings were made once in two years.) To fill the gaps Professor Douglas has made ingenious use of statistics which were collected in eight States. His methods of interpolation are fully described, and it is evident that at every stage of his task he was acutely aware of the exact significance of all the figures which were available to him, and of their imperfections.

On the basis of the average for the ten years 1890-99 Professor Douglas computes that the real wages of urban workers showed an increase of 7 per cent. in 1926, while those of farm labourers increased by 11 per cent. Increases of no less than 37 and 33 per cent. are shown in the case of teachers and coal-miners respectively. On the other hand, real wages were lower in 1926 for clerical workers (4 per cent.), postal workers (13 per cent.), gas and electrical workers (20 per cent.).

Discussing the position in the later years covered by his enquiry the author gives it as his opinion that the chief cause for the increase in real wages in the United States has been a general increase in productivity. "The real earnings of the employed were relatively constant from 1923 to 1927. There was an increase of physical productivity during this time, and apparently an increase also in value productivity. It is suggested that the failure of real wages to advance was at least one cause of the rising profits during this period and was consequently an appreciable factor in the extraordinary increase of stock market values which occurred."

The volume contains 231 tables and 95 charts! J. W. V.

10.—*New Zealand in the Making: a Survey of Economic and Social Development.* By J. B. Condliffe, D.Sc. 8½" × 5½". 524 pp. London: George Allen and Unwin, Ltd. 1930. Price 15s.

This volume by the former Professor of Economics at Canterbury College is an elaborate and critical survey of the economic and social progress of New Zealand from the arrival of Wakefield's colonists in

1840 up to 1928. Hardly any of the colonies of Great Britain can show such a striking record of progress over so short a period. The population has grown from a few thousands in 1840 to one and a half millions in 1927, and its export trade is now larger (per head of population) than that of any other country in the world. And this export trade, almost entirely of agricultural products, has been obtained and maintained in the competitive world markets.

For the first forty years (1840-80) the principal exports were wool, timber and gold. In 1882, however, the trade in frozen meat was started, and in the last ten years of the nineteenth century exports of dairy produce (butter and cheese) began to be considerable and grew so rapidly that by 1927 these three articles alone accounted for over 52 per cent. of the total exports (£48,500,000). Wool accounted for another 27 per cent., and the total agricultural products of all kinds covered more than 80 per cent. of all the exports.

The book opens with two chapters on the economic status of the Maori and the alienation of the land. These make interesting reading, and Dr. Condliffe does not avoid the unpleasant features of the land question or the problem of the place of the Maori in the economy of the country. The Maoris number about 65,000, and their position now is fairly satisfactory and affords scope for advancement.

The bulk of the volume, however, is concerned with the economic settlement and progress of the white colonists and a detailed consideration and criticism of the Dominion's social legislation enacted principally since 1890. New Zealand, it is well known, has been the pioneer of many experiments in social and labour legislation, and it is well to have a judicial appraisal from one who, in addition to a long residence in New Zealand, has had experience in and has studied economic problems elsewhere. Mr. Pember Reeves's book is probably the best known work dealing with the subject, and the present volume is of great value both as a supplement to, and to some extent a corrective of, the earlier work.

The best known of the legislation is probably the Conciliation and Arbitration Act of 1894, together with its amending Acts. These Acts, in addition to possessing compulsory powers in the settlement of trade disputes, can fix minimum rates of wages and regulate (in great detail if necessary) the conditions of employment. The Acts have not yet been applied to agriculture except in one or two cases (*e.g.*, sheep-shearers), and Dr. Condliffe, while admitting their success so far as regards manufacturing and what may be called "secondary" industries generally, doubts the wisdom of applying them to agriculture or any primary industry. No doubt the trades in which the Acts have hitherto operated are generally protected to some extent by import duties, and otherwise "sheltered" as we should say, and it has been found possible to pass on to the consumer the additional costs of production (if any), which have followed on awards of the Arbitration Court. With agriculture in New Zealand the case is different. It is principally an export trade and has to sell its products in the competitive markets of the world. It cannot, therefore, as

a matter of course pass on any increase in wages or other additional cost of production which has been imposed on it.

Dr. Condliffe, while to some extent critical generally of the special social and labour legislation of the Dominion, reserves a very vigorous condemnation for the state of education. To him the highly centralised system of primary education is a failure on account of the stereotyped uniformity and the inadequate provisions for a sound rural educational policy in a country principally agricultural. Moreover, the standards of secondary and university education are unduly low, and State provision for their improvement is hard if not impossible to obtain. Dr. Condliffe sees grounds for hoping the "worst phase of democratic obscurantism" in this connection has passed, but regrets that in the meantime New Zealand "has lost at least a generation of intellectual progress and has only too often provided a happy hunting-ground for quacks." His final word, however, is one of optimism, and the chief danger he sees is that New Zealand may rest content with its achievements and good fortune.

The volume would have been much improved if it had contained a satisfactory map, political and physical. The black-and-white charts are not always as clear as they might be. W. A. B.

11.—*Agricultural Russia on the Eve of the Revolution*. By George Pavlovsky, Ph.D. (Lond.). 9½" × 5½". xi + 340 pp.; 3 maps. London: Routledge. 1930. Price 15s. net.

At a time when agriculture is developing in Russia along new and untried lines, this exhaustive study of the agrarian problems of the decades preceding the Great War should prove especially welcome to students of the present and the future.

After a sketch of the natural and historical influences which have affected the agricultural geography of Russia, Dr. Pavlovsky reviews the agrarian situation at the time of the Emancipation of the Peasants in 1861, and its subsequent development up to 1917. The problem has been the subject of very conflicting views, and Dr. Pavlovsky's interpretation of the forces which determined the agricultural evolution of Russia form one of the most interesting features of the book. His conclusion is that the Russian agrarian problem, the "land hunger" among a large section of the peasantry and the generally miserable condition of the Russian country-side in the second half of the nineteenth century were due to the inherent weakness of Russia's economic system. The Emancipation, while it made the peasant a free man and the owner of his holding, abolished the old system of self-sufficient natural economy and forced him to seek for some sources of ready money. He had to sell either his produce or his labour, and for this change the economic system was not prepared. Capital was lacking, and it was many years before the industrial growth of Russia improved the condition of the agriculturist. Gradually, the construction of railways and the development of the home and foreign markets provided outlets and opened the way for the commercialization of agriculture, but the

agrarian organization was still based on open-field farming and communal tenure. This led to a low standard of production and at the same time encouraged an increase in population. Then came the reforms inaugurated by Stolypin in 1907. Among these, two developments stand out conspicuously: one was the enclosure and consolidation of holdings which aimed at bringing to an end the old system of scattered strips and open-field farming, and the other the growth of rural co-operation. This policy was sound, but the reforms came too late, and the Revolution occurred before the Enclosure Laws had been applied to more than about 10 per cent. of the peasants' holdings. How far the political situation would have been altered if this attempted solution of the agrarian problem had been begun twenty years earlier, it is now useless to enquire. Dr. Pavlovsky's opinion is that Government action along these lines only became possible as a result of the change in the general economic situation brought about by the industrial revolution in Russia. "Had the agricultural situation remained the same as before; had not the growth of Russian capitalism extended the agricultural market and infused capitalism into the village, and had the latter still been living under conditions of self-sufficient natural economy, all attempts at improving the position of the peasantry by encouraging enclosures, assisting the growth of rural co-operation and helping the technical progress of farming would have proved futile."

Another section of Dr. Pavlovsky's work deals with Russia's agricultural production, the disposal of its surplus and the position of arable and stock farming. He concludes with a short note on conditions under the present Government—which were changing even as he wrote. The book is published with the aid of a grant from the Publication Fund of the University of London, and was the thesis presented by Dr. Pavlovsky for the Ph.D. degree.

R. J. T.

12.—*The Economic Policy of Soviet Russia.* By Professor Paul Haensel, D.L.L.  $8\frac{1}{2}'' \times 5\frac{1}{2}''$ . vii + 190 pp. London: P. S. King. 9s. net.

*Russia To-day and to-morrow.* By Maurice Dobb.  $7\frac{1}{4}'' \times 4\frac{3}{4}''$ . 48 pp. London: Hogarth Press. 1930. 1s. 6d. net.

*The Five-Year Plan.* Introduction and explanatory notes to the map of the Five-Year Plan for the development of the national economy of the U.S.S.R. (2nd ed.) Compiled by W. P. Coates. Issued by the Anglo-Russian Parliamentary Committee. 1930. Text,  $9\frac{1}{2}'' \times 6''$ . 23 pp. Price 6d. Map  $45\frac{1}{2}'' \times 35\frac{1}{2}''$ . Price 2s. 6d.

The crop of books on the subject of Russia in the last few months has been very great. A subject so wide, however, has many aspects and there is little overlapping in the three books under review. The first one, *The Economic Policy of Soviet Russia*, is written by a professor who held the chair of Public Finance in the University of Moscow for twenty-five years and left Russia in 1928. In Tsarist times he had been a director of the State Bank in Russia. Under



the Soviet regime he has been since 1921 president of the financial section of the Institute of Economic Research attached to the commissariat for finance of the U.S.S.R. He claims to have been a free and impartial critic of Soviet economic policy, and when doing research work in London in August 1928 was deprived of his chair at Moscow. His book contains a great mass of statistics regarding various aspects of Russian economics, covering agriculture, industry, internal and external trade, transportation, public finance and the economic position of the working classes. The statistics throughout are taken from official sources but are sometimes difficult to follow. Instead of setting out his facts in the form of statistical tables, the author frequently describes the whole of the facts which should be in a table in an ordinary paragraph. These paragraphs are often extremely long, and it is not nearly as easy to comprehend the facts relating to some particular matter when they are related in a long paragraph, of which a considerable proportion is figures, as it is when the figures are set out in a well-constructed table. However, the facts are there, and with the assistance of the index they can be dug out. One of the first judgments which require to be formed in dealing with a book of this character concerns the reliability of the statistics. It is very easy to set forth masses of figures, and a substantial proportion of mankind is inclined to believe any statement which appears to be supported by figures, even if no proof is given of their accuracy. On the whole, although the writer of this book claims to be impartial, the unfortunate experience which he has had makes it almost impossible that he should be absolutely unbiassed. The impression given is that the author is inclined to lay more stress on the figures relating to those aspects of Soviet activities in which achievement has not reached expectation, than on the other aspects. But in a country in which affairs move so rapidly statistics quickly get out of date.

The second book, on *Russia To-day and To-morrow*, is also written by an academically trained man, Mr. Dobb being a lecturer in economics at Cambridge. He has visited Russia on various occasions in the last few years, and the present book is an extension of a paper which he read to a Society at Cambridge last year. Mr. Dobb appears to have no particular axe to grind and he writes in a most interesting manner on the development of the cultural side of Russian life. He looks upon the experience through which the Russian population is at present passing as a transition stage and seems to forecast that it will develop into a new age in which the standard of living, at least culturally, of the millions of people in Russia will be on a far higher plane than has hitherto been the case in other countries. In particular, in two spheres of culture, namely architecture and the cinema, he considers that there have already been epoch-making developments. It is interesting that these two spheres of cultural activity are collective rather than individual forms of art, and he considers that there is a strong presumption that these are the spheres in which the new socialist culture of Soviet Russia may achieve great things. Mr. Dobb's chapters on

economics and industry do not contain the mass of statistics which are common in other books, but are nevertheless extremely readable and create an impression as to the industrial and economic progress in Russia which differs from that put forward by Professor Haensel.

The third book, compiled from official Soviet statistics, is a valuable record of the results which have been reached in an economic programme unprecedented in the world's history, which Soviet Russia deliberately organised itself to undertake four years ago. It deals with each section of the programme in turn and shows what achievements have been made. In some it appears that the results have not reached the programme figure, in others they appear to have surpassed it. The only persons who are qualified to judge whether or not the statements made by the Soviet authorities in connection with any particular part of their programme are accurate or not are those who actually come in touch in some way or other with the programme. Those concerned with a particular industry in this country, for example, are in a fairly good position to ascertain whether or not the claims made for the development of the corresponding industry in Russia are or are not exaggerated; all that the reviewer is able to say on the point is that in those sections of which he has knowledge the claims are not exaggerated, and as those in a position to judge in other sections appear to have had similar experiences, the general conclusion is that the statistics published by Soviet Russia in connection with the five-year plan do represent, at any rate approximately, the actual achievement. E. C. S.

### 13.—Other New Publications.\*

*Easton (H. T.). The Work of a Bank. Revised and rewritten by H. G. Hodder. 7 $\frac{1}{4}$ "  $\times$  4 $\frac{1}{2}$ ". 312 pp. London: Effingham Wilson, 1930. Price 7s. 6d.*

[This is the fifth edition of a book originally published in 1898 and largely revised since the last issue, in 1916. The author's aim is to set out the practical work that a bank official may be called upon to undertake, and though departmental procedure can hardly be learned except by practice, it is certainly of advantage that an employee should have some understanding of the theory underlying that practice and the relation of his work to that of other departments and to the whole organization. After a general review of the functions of a bank and a particular account of the qualifications for employment therein, the work of the various departments of a banking house is described in considerable detail. One chapter deals with the Clearing System, and the last, "Recent Developments in Banking," briefly describes the Bank for International Settlements, the Agriculture Mortgage Corporation, and the Securities Management Trust. There is an index, but not a careful one, since in it the words "county clearing" appear three times when "country" is intended; carelessness may also be responsible for the "infer" which should of course read "imply" on p. 165.]

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\* See also "Additions to the Library," p. 153 *et seq.*

*Fenelon (K. G.). Road Transport Costs.* 8½" × 5½". 16 pp. Edinburgh: Blackwood, 1930.

[Owing to the short time that road transport has been in existence, standardized costing systems are not yet fully adopted, and in the author's view the neglect to keep proper accounts is largely responsible for "the long succession of failures" which have occurred in this industry since the war. Better organization is another pressing need, and this paper (which originally appeared in the *Accountants' Magazine* for August 1930), briefly touches on the economies which might be effected by means of freight exchanges and other forms of co-ordination, before passing to the main subject, which is the particular uses of cost records, and the best methods of keeping them. These are discussed by Dr. Fenelon in a simple and practical manner, the treatment of the various items is explained, and several examples of actual cost sheets are included as illustrations.]

*Mitrany (David), Ph.D. (Lond.). The Land and the Peasant in Rumania: the War and the Agrarian Reform (1917—21).* (Publications of the Carnegie Endowment for International Peace: Division of Economics and History.) 9½" × 6½". xxxiv + 627 pp. London: H. Milford; New Haven: Yale University Press, 1930. Price 20s.

[An account, which may be truly termed exhaustive, of Rumanian agriculture as it is to-day and of its preceding history. The survey of past conditions, which occupies Part I of the volume, goes back to the withdrawal of the Romans in the third century, and the outstanding facts are that the political freedom of the country brought a loss of freedom to the peasants, and that their status and prosperity further deteriorated after their statutory emancipation in 1864, so that at the beginning of the war they were subject to crushing financial burdens and had been reduced in effect to a condition of miserable serfdom. Part II describes the Land Reform brought about in 1918 when, as a result of the war and the warning of the Russian revolution, the large owners were expropriated and the major portion of the land divided among the peasants. Part III is a detailed examination of the effects of the reform on the distribution of land, the organization of farming, and rural economy in general, of the effects of the State's economic and financial policy on the working of the reforms, and of the social and political changes which have resulted from the application of the new laws. That agricultural production has somewhat diminished is chiefly accounted for by the fact that the reform was based on political and not economic expediency, and the land was distributed with the view of satisfying the greatest possible number of claimants, and especially sufferers from the war, without regard to their efficiency. The new owners were also handicapped by the lack of credit, by various restrictions and exactions, and by the Government's general neglect of agriculture in favour of industrial development. Better results can only come with improved agricultural technique, adequate credit facilities and accurate statistics. The book includes two maps, a lengthy bibliography, and a full index.]

*Mukhtyar (G. C.). Life and Labour in a South Gujarat Village.* 8½" × 5½". xx + 304 pp. London: Longmans, 1930. Price 10s. 6d.

[This volume embodies the results of an investigation into the social and economic life of the people of Atgam, the village chosen by the author as that most representative of conditions existing in South Gujarat. Of the four hundred and sixty-one families in the village, only nine were not connected in some way with agriculture, and for over half of them agriculture formed the chief or only source of income. The book includes

a detailed examination of agricultural methods, the labour problem, the marketing organization, and the relation between the people and the state; and in the last section the author reviews the causes of the extreme poverty existing, and draws up a programme of economic reconstruction.]

*Narain (Brij)*, M.A., Professor of Economics, Sanatana Dharma College. *Indian Economic Life*. 9" × 6". 578 pp. Lahore: Uttar Chand Kapur & Sons, 1929. Price Rs. 7.8.

[The keynote of this elaborate and painstaking study is given in the second paragraph of the author's introduction: "A country with India's natural resources should be one of the richest countries in the world. The fact that India is poor shows that there is need for large and fundamental changes in the country's economy." The next sentence summarizes the main conclusions. "The chief problem . . . to-day is that of the growing pressure of population on the soil. . . . There is only one solution . . . rapid industrialization of the country." The bulk of the book consists of a detailed examination of past and present economic conditions in India, and of the presentation of the evidence upon which the author bases his contentions. The first five chapters deal mainly with the sixteenth and seventeenth centuries, and show from the evidence of contemporary writers that the necessities of life at that time were abundant and extraordinarily cheap (one English traveller lived "competently" for three years on £12). Professor Narain seeks indeed to show that the condition of the lower classes was then much more favourable than is generally believed, and he is disposed to think that famines were no more frequent than now. The consideration of the present, which occupies Chapters VI to XXVIII, is divided into sections dealing respectively with Prices, Currency, Population, Agriculture, Trade, Industries and Transportation, and lastly, Banking and Finance. Two chapters are devoted to the rise of prices after 1861, and another to the further rise in 1905; a study is made of the relation of prices to exchange from 1873 to 1924; the figures of foreign trade are minutely analysed, and fifty pages are taken up with Indian industries. In the last chapter, on India's taxable capacity, the estimate given by Mr. Findlay Shirras before this Society of the relation of effective taxation to taxable capacity in 1921-22 (namely, 30 per cent.), is characterized as misleading: not only as being an incorrect figure for that particular year, but chiefly because "in an agricultural country taxable capacity must be considered with reference to a period of three to five years."

In a work of so much detail the summary of each chapter given in the table of contents is a most useful feature; in addition, there is an adequate general index and a separate index to the tables.]

*Niyogi (J. P.)*, M.A., B.L. *The Evolution of the Indian Income Tax*. 8½" × 5½". 326 pp. London: P. S. King, 1929. Price 12s. 6d.

[The fact that this study is one of the series of monographs by writers connected with the London School of Economics is evidence of its solid and workmanlike qualities. In it the author has traced the history of the Indian Income Tax from its first institution in 1860, and has made a critical examination of the present system. It is only lately that there has been any incentive for such an examination, since up to the time of the war the income tax was too unimportant a part of the Indian budget to be a subject of controversy or of particular interest. The introductory matter and historical account occupy the first nine chapters; the tenth deals with the Income Tax Act of 1918 and the Excess Profits Duty of 1919, the next with the legislation of 1922, and five more study the details, allowances and deductions, methods of assessment, machinery of collection, taxation of agricultural incomes, and double taxation. Finally, the author sets down his conclusions. He lays stress on the remarkable evolution of public opinion with respect to this tax, which on its introduction was expected to engender considerable ill-

feeling but now appears to arouse no special resentment. Mr. Niyogi's criticisms are mainly directed to the possibilities of evasion, and his recommendations are aimed at stricter enforcement, for psychological reasons as well as for the good of the revenue. He particularly advocates taxation of income at the source, and would have the authorities follow the British system even more closely than they do, and not be afraid of adding to the complexity of the Indian law in order to make the incidence of the tax more equitable. There are copious documentary references, a bibliography, and a full index.]

*Palmer (Alfred)*. *Company Secretarial Practice*. 7½" × 4½". xii + 356 pp. London: Longmans, 1930. Price 6s.

[A book of reference intended for the use of secretaries and others concerned in company administration, and as a guide for candidates for the examinations of chartered secretarial bodies. The treatment of the subjects discussed is practical and includes reproductions of a large number of official and other forms. There is an index, and the appendices include a list of the Returns, etc. to be filed under penalty, in accordance with the Companies Act, 1929.]

*Parkinson (Hargreaves)*. *The Small Investor*. 7" × 5". 118 pp. London: Blackie, 1930. Price 4s.

[The various facilities for the investment of small savings are in turn described, explained, and compared. Separate chapters are devoted to the various kinds of savings banks, to Stock Exchange investment, to Friendly Societies, Trade Unions, etc., and to the discussion of the possibilities of saving combined with consumption offered by building societies, the hire-purchase system, and the co-operative societies. The author is no doubt justified in claiming that this is the first time that a critical survey of all the available media has been given in one convenient little volume, and he may also claim to have given extremely clear and useful information, together with advice which the small investor would do well to follow. It is less admirable, however, that the latter should be led to believe that there are degrees in "ubiquity" and "universality," and that circumstances "transpire."]

*Rose (T. G.)*, M.I.Mech.E. *Business Charts*. 8½" × 5½". x + 94 pp. London: Pitman, 1930. 10s. 6d. net.

[The basis of this book was a series of articles on business statistics written by the author and published in the *Times Trade and Engineering Supplement*, but while the general plan of the original articles has been retained, the subject-matter has been entirely rewritten and augmented. The book does not pretend to appeal to expert statisticians; its object is rather to introduce to those not acquainted with the subject, and those who look with suspicion on anything graphical, the use of charts and graphs in everyday business. The subject is dealt with in a very straightforward and lucid manner; many of the customary pitfalls are carefully explained, and some valuable rules and suggestions for the beginner advanced. The book contains a very useful bibliography of graphics.]

*Fanstone (J. H.)*. *Dictionary of the World's Commercial Products*. 3rd ed. 8½" × 5½". 165 pp. London: Pitman, 1930. Price 5s.

[A list of the world's chief commercial products and manufactures with their French, German, and Spanish equivalents, a brief description of each, and the names of the places from which each is obtained. The first six entries in the volume will give some idea of its range. They are: abaca, abietine, abrasives, absinthe, acajou, acetal, and together occupy an aggregate space of one and a half columns. The book should be a useful work of reference.]

## CURRENT NOTES

From the usual table summarizing the trade of the United Kingdom in 1930 it will be seen that the aggregate money value of imports in that year was less than the value in the previous year by 14.4 per cent., and that there were reductions of 20.7 per cent. in re-exports, of 13.8 per cent. in net imports, and of 21.8 per cent. in exports of British produce and manufactures. On account of changes in the levels of average values these figures do not give a representation of alterations in the volume of trade, but, by revaluing the commodities imported and exported on the basis of the values prevailing in 1924, the following comparison is obtained :—

Trade.	1924	1928	1929	1930.
	£ mill.	£ mill.	£ mill.	£ mill.
Imports ... ..	1277	1349	1417	1381
Exports of Imported Produce	140	123	119	113
Retained Imports ... ..	1137	1226	1298	1268
British Exports ... ..	801	838	868	710

Gross imports in 1930 were thus 8.1 per cent. greater in volume than in 1924 but 2.5 per cent. less than in 1929, while retained imports were 11.5 per cent. greater than in 1924 and 2.3 per cent. less than in 1929. British exports were 11.4 per cent. less than in 1924 and 18.2 per cent. less than in 1929. The excess of the value of imports over the value of exports of merchandise was £387,307,000 in 1930, £381,714,000 in 1929, and £351,736,000 in 1928. Last year there was an excess of imports over exports of bullion and specie, while in the two previous years the outward movement was the greater. Taking both merchandise and bullion into account, the excesses of imports over exports which have to be balanced by "invisible exports," if at all, are £392,337,000 for 1930, £365,784,000 for 1929, and £358,432,000 for 1928 (excluding £18,400,000 of gold pledged by France in earlier years and now transferred). It was estimated by the Board of Trade that, after taking into account all transactions between the United Kingdom and all other countries, other than the lending and repayment of capital, there was a credit balance of £152,000,000 in 1928 and one of £151,000,000 in 1929; their estimate for 1930 will be awaited with much interest.

The decrease of £175,925,000 in imports in 1930 compared with 1929 was mainly made up of £59,923,000 for food, drink, and tobacco, £88,769,000 for raw materials, and £26,863,000 for manufactured articles. The total weight of grain and flour imported was less than in 1929 by only 46,000 tons, although there was a reduction of very nearly £23,000,000 in value. Wheat was down by 338,000 tons and £14,655,000, while wheat flour was up by 102,000 tons and £319,000. Increased quantities of barley and oats were imported, but there was little change in maize and rice. There was a slight increase in imports of beef with a slight fall in average value per unit, while there was an increase of 13·3 per cent. in the imports of mutton and lamb, accompanied by a fall of 8·6 per cent. in value per unit. There were also increases, more or less substantial, in the quantity of imports of bacon and hams, butter, cheese, eggs, fish, and the principal kinds of fruit. The quantity of tea imported was less than in 1929, but, the quantity exported decreasing at about the same rate, tea retained was less by only 2·4 per cent., while there was a reduction in the average value of tea imported of about 6·3 per cent. per lb. There were relatively heavy decreases in the quantities of cocoa, raisins, spirits, raw sugar, and wine imported, but a decline of less than 2 per cent. in tobacco. Retained imports of raw materials show general reductions—about 27 per cent. in iron ore; 22·2 per cent. in raw cotton; 15·4 per cent. in raw silk, cocoons, and noils; 9·6 per cent. in flax and tow; 37·5 per cent. in jute; 18·2 per cent. in oil-seeds and nuts; 5·4 per cent. in crude petroleum; 6·4 per cent. in wood-pulp; 2·6 per cent. in rubber. Both the gross imports and the re-exports of sheep's wool fell off, with the net result that the retained imports were greater by 2·5 per cent. in 1930 than in 1929. There were also increases of 18·8 per cent. and 20 per cent. respectively in the quantities of wet and of dry hides imported and retained. Heavy increases in imports of pig iron and sheet and tinplate bars were in part balanced by decreases in other iron and steel goods, and in the mass the retained imports of "iron and steel and manufactures thereof" increased only by 3 per cent., from 2,813,000 tons to 2,896,000 tons. Altogether, the net imports of goods wholly or mainly manufactured showed a reduction of £22,127,000, or 7·2 per cent., compared with 1929. This is much smaller than the reduction in net imports of raw materials, but it must be remembered that the "manufactured" class includes non-ferrous metals, which are mainly semi-manufactured materials for British industry, and refined petroleum, which is only to a small extent produced in the United Kingdom. These two groups of products contributed 22·4 per cent. and 23·5 per cent. towards the total value of retained imports of manufactures in 1929 and 1930.

Omitting them, the remaining retained imports fell in value from about 237 to about 217 million pounds, or by 8·5 per cent.

Turning to British exports and making comparisons with 1929, food, drink, and tobacco fell in value by 13·3 per cent., raw materials by 19·1 per cent., and manufactured goods by 23·4 per cent. The only two groups of products to show increases were "living animals for food" and "vehicles." Exports of coal fell from 60,267,000 tons to 54,879,000 tons, and by nearly £3,000,000 to £45,671,000; coal shipped for fishing and foreign trade bunkers also fell from 16,391,000 tons to 15,617,000 tons. Iron and steel and manufactures thereof were less in 1930 by 27·9 per cent. in quantity and by 24·6 per cent. in value; the tonnage of exports in 1930 was only about 9 per cent. above the tonnage of retained imports as against nearly 56 per cent. in 1929. Machinery showed a decrease of 14·4 per cent. in quantity and of 13·7 per cent. in value. Cotton piece-goods fell from 3,672 million square yards to 2,407 million square yards, and by nearly £38,000,000 in value; while woollen and worsted tissues declined by nearly 28 per cent. in value and from 155,467,000 square yards to 113,754,000 square yards. Carpets, silk goods, artificial silk goods, linen goods, jute goods, all shared in the general decline, which over the four textile groups (representing about one-third of the total value of manufactured exports in 1930) amounted to £71,722,000, or 33 per cent. Apparel showed moderate decreases of about 2 per cent. in outer garments and nearly 10 per cent. in boots and shoes, but heavy reductions in hats and hosiery. In the group of chemicals and allied products exports of sodium compounds were less by nearly 24 per cent. and paints by about one-fifth, but the decreases in ammonium sulphate and bleaching powder were only 5 per cent., and that in disinfectants 10 per cent., while there was a small increase in sulphate of copper. Reductions were over 16 per cent. in soap, about one-third in leather, and nearly 16 per cent. in paper and cardboard. In the vehicle group, exports of locomotives increased from 40,316 to 50,566 tons and exports of railway wagons from £2,398,000 to £3,177,000, but exports of railway carriages fell from £2,418,000 to £1,845,000. Touring and commercial motor vehicles and chassis decreased from 42,011 to 29,753, motor cycles from 62,428 to 42,689, and pedal cycles from 368,000 to 247,000; but other road vehicles increased from 102,000 to 105,000, and rubber pneumatic tyres and tubes from £4,063,000 to £4,381,000. The tonnage of merchant steam vessels exported fell from 296,000 gross tons to 283,000 gross tons, but the value rose from £8,958,000, to £9,530,000, while the



Movements and Classes.	Twelve Months ending December, 1929.	Twelve Months ending December, 1930.	Increase (+) or Decrease (—). in 1930.			
<b>Imports, c.i.f.—</b>	£'000.	£'000.	£'000.			
Food, drink, and tobacco	535,475	475,552	— 59,923			
Raw materials and articles mainly un- manufactured	339,577	250,808	— 88,769			
Articles wholly or mainly manufac- tured ...	334,361	307,499	— 26,862			
Other articles ...	11,352	10,981	— 371			
Total Imports ...	1,220,765	1,044,840	—175,925			
<b>Exports, f.o.b.—</b>						
<i>United Kingdom Produce and Manufactures—</i>						
Food, drink, and tobacco	55,656	48,252	— 7,404			
Raw materials and articles mainly un- manufactured	78,901	63,815	— 15,086			
Articles wholly or mainly manufac- tured ...	573,799	439,731	—134,048			
Other articles ...	20,993	18,734	— 2,259			
<i>Imported Merchandise—</i>						
Food, drink, and tobacco	26,013	23,808	— 2,205			
Raw materials and articles mainly un- manufactured	54,293	38,376	— 15,917			
Articles wholly or mainly manufac- tured ...	28,897	24,162	— 4,735			
Other articles ...	499	635	+ 136			
Total Exports ...	839,051	657,533	—181,518			
<b>Bullion and Specie—</b>						
Imports ...	70,742	95,175	+ 24,433			
Exports ...	86,672	90,146	+ 3,474			
<b>Movements of Shipping in the Foreign Trade—</b>	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.
<i>Entered with cargoes—</i>						
British ...	31,737	40,747	31,109	40,787	— 628	+ 40
Foreign ...	25,542	21,954	26,200	22,928	+ 658	+ 974
Total entered ...	57,279	62,701	57,309	63,715	+ 30	+ 1,014
<i>Cleared with cargoes—</i>						
British ...	41,024	45,338	38,424	42,621	—2,600	— 2,717
Foreign ...	23,545	23,342	22,682	23,233	— 863	— 109
Total cleared ...	64,569	68,680	61,106	65,854	—3,463	— 2,826

tonnage of motor vessels rose from 74,000 gross tons to 356,000 gross tons, and the value from £2,529,000 to £9,314,000.

The aggregate tonnage of vessels entered with cargoes in 1930 was 63,715,000 net tons, a moderate increase over 62,701,000 net tons in the previous year, but, while foreign shipping rose by nearly a million tons to 22,928,000 net tons, British shipping increased only from 40,747,000 net tons to 40,787,000 net tons. Clearances with cargo fell from 68,680,000 net tons in 1929 to 65,854,000 net tons in 1930, the bulk of the decrease falling on British shipping, which declined from 45,337,000 net tons to 42,621,000 net tons.

As measured at the Board of Trade, the general level of wholesale prices in this country continued to fall heavily in the second half of 1930. The rate of decrease in comparison with prices of the preceding month, which stood at 1 per cent. in June, increased to 2.2 per cent. in October, and after a fall to 0.9 per cent. in November, reached 2.8 per cent. in the last month of the year. The result was that the Board of Trade index-number, which has as its base 1924 average prices, fell from 72.6 for June prices to 65.5 for December prices, the latter figure being no less than 17.8 per cent. below that for a year before. This drop of 17.8 per cent. in one year was practically the same as is shown by comparison of the average for 1929 with that for 1924. The index-number for the average of wholesale prices throughout 1930 was 71.9 as compared with 82.1 for the year 1929. The decline thus shown by the comparison of the averages for 1929 and 1930 was 12.4 per cent., which was almost as great as the decline between December, 1925 and December, 1929 (12.9 per cent.). With regard to the rate of decrease in the principal groups of commodities, the general level in 1930 was lower for all of them than in 1929, particularly in the groups of cereals, cotton, wool, other textiles, and other metals and minerals. The wholesale prices for food in December, 1930, were about 30 per cent. lower than in 1924 and 17.5 per cent. lower than a year before, and industrial materials averaged nearly 37 per cent. cheaper as compared with the base year 1924 and nearly 18 per cent. cheaper than in December, 1929. The largest decline in any group in December, 1930, as compared with 1924, was for cotton (55.9 per cent.), and the wool group showed a decline nearly as great, viz. 53.4 per cent. As compared with 1929, the largest decline in December 1930 was shown by wool, followed by other textiles, cotton and cereals, each of these groups showing a decline of over 20 per cent. in the year. If the average of prices for the year 1913 be substituted as the base of the index-number, the general index for December, 1930, was 108.9, while that

for the year 1930 was 119.5. In the last-named figure the index for food-stuffs was 126.6, while that for industrial materials was 119.5.

The tale of the descending level of wholesale prices in this country in the second half of 1930, as told by the *Statist* index number, may be summarized in the following table:—

At the end of	Index-number.	Reduction on a month before. Per cent.	Reduction on a year before. Per cent.
July ... ..	94.4	1.5	18.1
August ... ..	92.2	2.3	19.1
September ... ..	90.8	1.5	19.4
October ... ..	90.4	0.4	18.6
November ... ..	88.6	2.0	18.2
December ... ..	86.9	1.9	20.1

The fall of 20.1 per cent. in wholesale prices during the year was of a widespread character, each subsection of prices having been affected by it. Vegetable foods fell by 23 per cent., animal foods by 12 per cent., groceries by 17.5 per cent., minerals by 14.5 per cent., textiles by 40.2 per cent., and sundry materials by 15.5 per cent. The result was to bring the index-number to within 2.2 per cent. of the average figure for 1913, and is characterized by the *Statist* as the final lap in the return of wholesale prices to the neighbourhood of pre-war prices. The *Statist* further observes that its measure of the total reduction in wholesale prices since the return of the pound to the gold standard in 1925 to the end of 1930 was 36.8 per cent. The provisional figure quoted for the average of wholesale prices throughout the year is 96.2, or about 13 per cent. above the 1913 average.

Between the end of July and the end of December the fall in the general level of wholesale prices as measured by the *Economist* index-number (average, 1927 = 100) was 11.5 per cent., the index-number falling between these dates from 77.6 to 68.7. The latter figure represented a decrease of 22.2 per cent. on that at the end of 1929. On the alternative basis for its index-number quoted by the *Economist*, i.e. average prices for 1924, the index-number at the end of 1930 stood at 59.4, the lowest figure for the component groups being 37.6 for textiles and the highest being 71.2 for the miscellaneous group. The *Economist*, as does also the *Statist*, draws attention to the growing disparity between the level of wholesale prices and that of retail prices, and summarizes the position in the following table,

in which the movements of the two levels are both related to the average of 1924.

Aggregate Percentage fall to	Wholesale Prices.	Cost of Living.	Wholesale Food.	Retail Food
End of 1925 ... ..	7.7	—	7.5	—
1926 ... ..	12.5	—	10.5	1.9
1927 ... ..	14.5	4.0	12.5	4.9
1928 ... ..	18.0	4.6	15.0	6.6
1929 ... ..	23.7	5.1	20.0	7.6
1930 ... ..	40.6	11.4*	36.5	17.2*

\* End of November.

Owing to the larger part played by cereals in the wholesale price index-number as compared with the retail prices index-number as calculated by the Ministry of Labour, precise inferences cannot be drawn from these figures, but, as the *Economist* remarks, the dimensions of the disparity are such as to present a problem of prime importance. Turning to the ratio of current prices to the pre-war level, the *Economist* finds that on the basis of the latter its index-number at the end of 1930 stood at only 98.7, indicating that the collapse of wholesale prices had carried the current level even slightly below the pre-war level.

Movements in the general level of retail prices in Great Britain and Northern Ireland during the second half of 1930, as estimated by the Ministry of Labour, were as follows :—

At the beginning of	Percentage Increase in Retail Prices since July, 1911.		
	Food only.	Other Items included in the Budget.	All Items included in the Budget.
	Per cent.	Per cent.	Per cent.
August ... ..	44	76	57
September ... ..	44	76	57
October ... ..	43	75	56
November ... ..	44	76	57
December ... ..	41	76	55
January ... ..	38	75	53

Increases in the items other than food covered by the average figure of 75 per cent. on January 1 were 54 per cent. for rent (including rates), 105 per cent. for clothing, 75 per cent. for fuel and light, and 75 per cent. for other items. In reviewing the course of this index-number throughout 1930, the *Labour Gazette* observes that it followed

an abnormal course. The usual seasonal decline in the earlier part of the year was accentuated by a general downward trend in prices, which subsequently retarded, and on October 1 and December 1 more than neutralized, the normal tendency towards a recovery of prices in the latter part of the year. From 66 per cent. above pre-war on January 1, 1930, when it was only one point below the corresponding figure for a year before, the index-number fell rapidly to 54 on May 31, or 6 points below that of a year before, and at the end of the year the reduction on the year amounted to 13 points, the greatest reduction recorded in any single year since 1922. The average of the index figure for the whole year 1930, viz. 58 per cent. above pre-war, was the lowest recorded in any year since 1916, and compares with 64 per cent. for 1929 and 66 per cent. for 1928.

The following table summarizes for the principal countries the latest information as to retail prices overseas as reproduced in the *Labour Gazette*. The third column gives the estimated percentage increase in retail food prices on those ruling in July, 1914, or some similar pre-war period; the fourth column gives the estimated percentage increases for all items covered by the Budget in each case, such items, in addition to food, comprising, generally, rent, clothing, fuel and light, and other household requirements.

Country.	Date of latest Return.	Food.	All Items.
<i>Overseas Dominions, etc.</i>			
Australia ... ..	November, 1930	Percentage increase.	Percentage increase.
Canada ... ..	December, 1930	35	45 (2nd qr.)
India (Bombay)* ... ..	December, 1930	38	51
Irish Free State ... ..	October, 1930	16	22
New Zealand ... ..	October, 1930	56	68
South Africa ... ..	November, 1930	39	55
	November, 1930	8	26
<i>Foreign Countries.</i>			
Belgium ... ..	November, 1930	—	772
Czechoslovakia ... ..	November, 1930	20	4 (Prague)
Denmark ... ..	October, 1930	32	62
Egypt (Cairo)... ..	August, 1930	33	—
France (Paris) ... ..	December, 1930	549	492 (3rd qr.)
France (other towns) ... ..	November, 1930	550	—
Germany ... ..	December, 1930	35	42
Holland (Amsterdam) ... ..	September, 1930	—	62
Italy ... ..	October, 1930	413 (Nov.)	425 (Milan)
Norway ... ..	December, 1930	47	72
Spain (Madrid) ... ..	October, 1930	92	—
Sweden ... ..	January, 1931	34 (Dec.)	61
Switzerland ... ..	November, 1930	51	57
United States... ..	November, 1930	39	67 (June)

\* Native families.

With reference to statistics relating to employment in Great Britain and Northern Ireland quoted on p. 624 of Part IV 1930 of the *Journal*, the *Labour Gazette* recorded in each of the months July to November a continuous decrease in the volume of employment. In December there was a slight improvement before Christmas, but otherwise employment continued to decline, and at the end of the year the numbers unemployed reached a figure higher than any recorded in the period of ten years for which comparable statistics are available. The course of these official statistics in the second half of the year was as follows:—

Date.	Number of Persons on Unemployment Exchange Registers.		
	Numbers Unemployed (including persons normally in casual employment).	Numbers Temporarily stopped.	Numbers Unemployed normally in casual employment.
June 23 ... ..	1,160,935	562,134	92,273
July 21 ... ..	1,226,404	652,451	93,875
Aug. 25 ... ..	1,333,850	609,309	96,543
Sept. 22 ... ..	1,413,242	596,773	99,643
Oct. 27 ... ..	1,551,095	581,614	104,792
Nov. 24 ... ..	1,659,867	521,305	105,288
Dec. 29 ... ..	1,766,398	774,630	102,099

The percentage of unemployed among insurable workpeople in Great Britain and Northern Ireland varied as follows:—

June 23 ... ..	15·8	Oct. 27 ... ..	18·7
July 21 ... ..	17·1	Nov. 24 ... ..	19·1
Aug. 25 ... ..	17·5	Dec. 22 ... ..	20·2
Sept. 22 ... ..	17·6		

In a review of employment and wages during 1930 the *Labour Gazette* says that the severe industrial depression which began to develop towards the close of 1929 continued with increasing intensity throughout 1930. The number of insured persons aged 16 to 64 in employment in Great Britain fell from an estimated average of 10,207,000 in 1929, the highest average figure recorded, to an average of 9,764,000 in 1930, the lowest figure since 1926, the year of the prolonged coal stoppage. The average percentages of insured persons recorded as unemployed, including those temporarily stopped, in each year from 1921 to 1930 have been as follows:—

1921 ... ..	17·0*	1926 ... ..	12·5*
1922 ... ..	14·3	1927 ... ..	9·7
1923 ... ..	11·7	1928 ... ..	10·8
1924 ... ..	10·3	1929 ... ..	10·4
1925 ... ..	11·3	1930 ... ..	16·1

\* Exclusive of persons in the coal-mining industry disqualified for unemployment benefit by reason of trade disputes.

It should be noted that some part of the increase in the numbers on the Employment Exchange register during 1930 was due to changes in the conditions for the receipt of unemployment benefit brought into operation on March 13, 1930, by the Unemployment Insurance Act, 1930, which also affected the figures on which the published percentages of insured persons recorded as unemployed are based. The decline in employment was felt most severely in the textile trades, in coal and metalliferous mining, in pottery and earthenware manufacture, in metal manufacture and the metal trades, and in engineering, shipbuilding, and ship-repairing. 27 per cent. of the total increase of the unemployed in all industries taken together was attributable to the textile industries, and 24.8 per cent. to coal mining, iron and steel manufacture, engineering, shipbuilding and ship-repairing.

During 1930 the Ministry of Labour recorded a small net reduction in rates of wages, but the amount was less than in any previous year since 1926, and the great majority of workpeople were unaffected by any changes. In all the industries and services for which the Ministry has statistics, changes during the year resulted in an aggregate net increase of about £57,800 in the weekly full-time rates of wages of 760,000 workpeople, and in a net decrease of about £115,800 in those of 1,100,000 workpeople. The effect of the net reduction on the general level of wages was relatively small, the average decrease for all industries combined being equivalent to about one-fourth of one per cent. of the wage rates in operation at the beginning of the year. The statistics quoted above are exclusive of changes affecting agricultural workers, Government employees, domestic servants, shop assistants and clerks: further, they relate to rates of wages for a full week, assuming full employment, and do not take account of variations in actual earnings arising from changes in the rate of employment. If agricultural workers are included with those workers regarding whom statistics are available, the Ministry of Labour estimates that at the end of 1930 the average increase in the weekly full-time rates of wages since July, 1914, was between 70 and 75 per cent. As the number of hours constituting a full working week was reduced in nearly all industries in 1919 or 1920, the percentage increase in hourly rates of wages between 1914 and 1930 was greater than the increase in weekly rates.

The total number of workers whose normal hours of labour were reported to the Ministry of Labour as having been changed in 1930 was approximately 357,000: of these 12,550 had an average increase of rather under one hour per week, and about 344,000 had an average

reduction of about  $2\frac{1}{2}$  hours per week. The reductions were almost entirely accounted for by the changes which took place in the hours of coal-miners as a result of the Coal Mines Act, 1930. Reviewing changes in hours since 1919, the Ministry of Labour notes that since the widespread reductions in hours of labour in 1919-20, hours generally have remained practically unchanged apart from the years 1926 and 1930, in both of which the large majority of the workers affected by changes were coal-miners.

The number of trade disputes of any significance causing stoppage of work reported to the Ministry of Labour as beginning in 1930 in Great Britain and Northern Ireland was 415, as compared with 420 in 1929. The number of workpeople directly involved (*i.e.* on strike or locked out) in these disputes was about 287,300, and the number indirectly involved was 20,300. In addition about 1,800 workpeople were involved, directly or indirectly in eight disputes which began in 1929 and continued into 1930. The total number of workpeople involved in all disputes in progress in 1930 was thus approximately 309,400, as compared with 533,800 in the previous year. The aggregate number of working days lost in 1930 by workpeople involved in all the disputes in progress during the year, whether beginning in 1930 or 1929, was 4,404,000, as against 8,287,000 in 1929. Two disputes, one occurring in the wool textile industry and one in the coal-mining industry, accounted for about two-thirds of all the workpeople involved in disputes in 1930, and to the former of these two disputes nearly three-quarters of the total loss of time through disputes was due.

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Official statements as to employment in Germany, quoted from the *Reichsarbeitsblatt* by the *Labour Gazette*, showed that in May and June, in spite of seasonal improvements in certain directions, unemployment continued to grow. The depression became more marked in the following months, and its course may be traced in the following summary of official statistics, which also gives a comparison with the figures for the end of November, 1929. The second column, under "Number seeking work," gives the total number of persons reported by the Labour Exchanges as available for and seeking work. The third column gives the number of persons reported by the Labour Exchanges as actually unemployed, and the last column gives the percentage of unemployed members disclosed by returns received from national trade unions with a total membership of over  $4\frac{1}{2}$  millions.



At the end of	Number seeking Work.	Number Unemployed	Percentage of Trade Union Unemployment.
May, 1930 ... ..	2,690,898	2,634,718	19.5
June, 1930 ... ..	2,696,083	2,640,681	19.5
July, 1930 ... ..	2,818,699	2,785,258	20.5
August, 1930 ... ..	2,938,274	2,882,531	21.7
September, 1930 ... ..	3,067,185	3,004,275	22.5
October, 1930 ... ..	3,320,413	3,252,082	23.6
November, 1930 ... ..	3,763,404	3,698,946	26.0
December, 1930* ... ..	4,432,700	4,357,000	—
November, 1929 ... ..	2,100,910	2,035,667	13.7

\* Provisional Figures.

In France unemployment continued to be inconsiderable in volume, though in the last four months of the year it showed a marked increase on the previous purely nominal figure. At the end of June the total number of persons on the registers of the Employment Exchanges was only 9,813. By the end of the year this number had risen to 26,514. In Belgium the level of unemployment was distinctly higher than a year before. Returns received from over 160 approved unemployment insurance societies with a total membership of approximately 639,000 showed that the lowest percentage of unemployed was found at the end of May, when it stood at 1.9. By the end of October this percentage had risen to 4.3, which compared with 0.5 a year before. In the Scandinavian countries, the Norwegian trade union returns also showed a level of unemployment above that of a year before. At the end of April the difference was trifling (*viz.* 12.6 per cent. as against 12.3 per cent. a year before), but after falling to 9.3 per cent. in July, the figure rose to 14.7 per cent. at the end of October, or nearly a third more than that at the end of October, 1929 (11.5 per cent.). The Swedish trade union percentage of unemployment remained fairly stable from May to September. At the end of the latter month it stood at 9.4; then in the next two months it rose to 15.2, which was about 50 per cent. above the figure of a year before (10.4). In Denmark returns supplied to the Danish Statistical Department by trade unions and by the Central Employment Exchange showed a seasonal swing in the percentage of unemployment from 12.0 at the end of May to 9.1 at the end of August, and up again to 15.3 at the end of November. In 1929 the corresponding figures were 10.8, 9.1 and 13.0 respectively.

In Canada the index-number of employment is based upon returns received from approximately 7,400 firms employing over one million workpeople, and has as its base the average volume of employment during the year 1926. Standing at 116.5 on June 1, the index-numbers rose slightly the next month to 118.9, but by

October 1 it was back to 116.2, and then fell to 108.5 on December 1. In the second half of the year the figures were about 10 points below those for the corresponding months of 1929.

The monthly report on employment issued by the Federal Department of Labour Statistics at Washington is now based upon returns received from over 41,000 establishments in various branches of industry and commerce and covers nearly  $4\frac{3}{4}$  million workpeople. This record disclosed a monthly shrinkage of employment, increasing from 0.9 per cent. in May to 2.6 per cent. in July. This movement was reversed by an increase of 1.0 per cent. in September, then the downward movement began again, reaching 2.5 per cent. in November. The index-number of employment which has a more restricted basis, being confined to 12,500 establishments in 54 of the chief manufacturing industries in the United States, fell continuously from 87.7 in May to 76.5 in November. The corresponding figures for these months in 1929 were 99.2 and 94.8 respectively.

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Preliminary Reports on the Third Census of Production were issued during 1927 and the early months of 1928; the beginning of the Final Report has been rather seriously delayed, the first of the volumes having been issued in the middle of last year. This first volume dealt with the Textile Trades, and we understand that a second volume dealing with the Food and Clothing Trades is in an advanced stage of preparation. The Report on the Textile Trades indicates the character of the detail which may be looked for when the Reports on other trades appear. As in the case of the Preliminary Reports, so in the Final, comparisons are presented between the results of the 1924 Census and those of the First Census for 1907. In the case of the Textile Trades, a considerable amount of information is also given with reference to the results of the Second Census relating to 1912, with appropriate warnings as to the comparability of the data, in view of the fact that the 1912 Census did not cover the smallest class of establishments, and omitted the building trades and some trades of minor importance. Broadly speaking the defects of comparisons with 1912 do not appear to be very serious in the case of the Textile Trades; neither does the fact that the 1924 Census did not extend to the Irish Free State form a very disturbing factor in the majority of the comparisons made. The Final Report gives not only fuller details regarding the goods made in the different trades than were given in the Preliminary Report, but also gives separate figures for Scotland and for Northern Ireland, wherever the separate presentation can be made without

revealing the business of individual firms in one or other of these divisions of the United Kingdom. The results of various voluntary questions included in the 1924 Schedules are also set out in the Report. Broadly speaking, the reader gathers that the response to voluntary questions has rarely been full enough to give the results a very high value. The information aimed at would have thrown a good deal of light on various features of industrial organisation and practice if the information had been complete: in view of its partial character it is not a matter for great surprise that for the Fourth Census, covering the year 1930, the major part of these special enquiries are not being continued. Two features of the additional particulars furnished in the Final Report have a special interest as a marked advance on the standard of the First Census Report. One is, that in place of figures showing numbers employed at quarterly intervals during the year, the numbers of operatives are given for one week in each month of the year, and separate figures for males and for females are shown in these tables. The seasonal movement of employment will thus be able to be traced in the various groups of trades in this country as it has long been in the United States. A further special feature is that though the Census of Production Act excludes wages from the subjects, for enquiry into which that Act provides compulsory powers, the voluntary investigation carried out by the Ministry of Labour for 1924 has been co-ordinated with the results of the Census, so that, trade group by trade group, figures are given for the aggregate of the employers who furnished to the Ministry of Labour particulars relating to wages. The figures give the number of operatives covered by the wages totals, comparing them with the total of operatives in the trade group, and also make a comparison between the total wage payment and the total net output, that is, the excess of the value of the products over the value of the materials used and the payments to other firms for work done. In the general introduction to the Textile Trades Report there is a special study for the group of trades as a whole, with details for the individual trades, of the data relating to the mechanical power used, showing the proportion applied electrically. The comparison is, in this case, of particular advantage, as for that year information was obtained regarding electric motors, which had not been secured for 1907. An examination of the particulars furnished regarding fuel used, particulars that had to be obtained on a voluntary basis, furnishes further evidence of the difficulties in determining the precise significance of partial data in view of the probability of the sample being biased, while the nature and probable extent of the bias is a matter of speculation.

An important volume (*Statistical Tables relating to British and Foreign Trade and Industry, 1924-30*, Cmd. 3737) has recently been issued by the Board of Trade, containing a statistical review of post-war trade and industry. This volume is in the nature of a sequel to the volumes which were published in 1903 (Cd. 1761), 1904 (Cd. 2337), and 1909 (Cd. 4954), containing statistical tables and charts with reference to British and foreign trade and industry since 1854. The new volume (which is the first of two) shows the broad movement of trade and the conditions of British industry as a whole, and is divided into ten sections: (1) Overseas trade of the United Kingdom, (2) Trade of the British Empire, (3) Trade of foreign countries, (4) Customs Tariffs, (5) Shipping, (6) Finance, (7) Prices, (8) Employment and wages, (9) Population movements and migration, and (10) Production. The second part, which it is hoped to issue at an early date, will deal with the production of and trade in certain principal groups of commodities and with the "safeguarded" industries; it will also contain a series of tables on food supplies. The present volume will be found a most useful compendium of information on the subjects referred to. It is prefaced by an introductory table which gives in a convenient form a comparison of the trade of this country and other leading countries in the last five years with that in 1913. There is, unfortunately, no detailed index (which, indeed, would have been difficult to compile), but the statement of contents of the various sections goes some way towards compensating for this omission. The form of the tabular matter is admirable. The only instance noted in a perusal of the tables in which the canons of best statistical practice have been to some small extent departed from is in the table showing trade per head of the population in each year since 1924. This is worked out to two places of decimals, based on post-censal forecasts of population provided by the Registrar-General. These, however, may be proved to be inaccurate when the final estimates, which can only be computed when the results of the 1931 census are disclosed, are available, and therefore the figures of trade per head may not be correct beyond the first place of decimals. On the other hand, the trade aggregates dealt with are in some cases relatively small, resulting in amounts per head containing two significant figures only.

The International Labour Office of the League of Nations has recently issued a handbook on Statistical Methods for Measuring Occupational Morbidity and Mortality (Studies and Reports, Series N (statistics) No. 16, price 5s.). The information used has been obtained mainly from official publications of various countries. For anyone who has to study occupational risks this will form a useful

guide. The various pitfalls inherent in some statistical methods still employed (*e.g.* mean age at death, proportional mortality rates) are set out, and the importance of the age, sex, and civil state factors is stressed. Attention is rightly paid to the difficulties of isolating the occupational factor from the non-occupational factors, such as geographical differences, selective forces affecting entries to and exits from an industry, economic status, etc.

Dangerous occupations, it is concluded, are not likely to show the greatest excess of morbidity or mortality at highest ages, as selection in the way of choice of occupation, transfer to other occupations, and death modifies the rise. The stronger the selective forces of recruitment and transfer, and the greater the danger, the more convex the curve is likely to be, and therefore a convex excess curve of mortality or morbidity may be considered as strong evidence that this excess morbidity or mortality is occupational.

A final section of the report is devoted to the problem of an international comparison of mortality and morbidity statistics, and a tentative attempt is made in the case of a few occupations.

The post of Chancellor of the Exchequer is in popular estimation the second in importance in the government of the United Kingdom. The Royal Statistical Society has, collectively, no politics, but it is proud to number among its Fellows the present holder of that distinguished office. It is, therefore, not inappropriate to draw attention to a little book entitled *Philip Snowden, the Man and his Financial Policy*, by Professor A. Andréadès, recently published by P. S. King and Son, Ltd., (xiii + 110 pp., price 5s. net). It gives an interesting sketch of Mr. Snowden's career and derives his social policy, both as regards temperance and finance, from his Puritan upbringing. The bulk of the book is devoted to an exposition of Mr. Snowden's financial programme, which, in its early form of "A Few Hints to Lloyd George," included "a super-tax on large incomes, a special tax on industrial monopolies, an increase in the Estate Duty, a tax on Land Values." The Capital Levy, the Budget of 1924, the Hague Conference, and the Budget of 1930 form the topics of successive chapters. One comment by Professor Andréadès is that indirect taxation, even if it raises prices, is useful as compelling "everyone to take his share in bearing national burdens." Mr. Snowden would no doubt react violently against this view, but he must be gratified by the opinion that the "author" of the 1930 Budget "possesses qualities which are becoming more and more rare in a Finance Minister, and which have at all times been exceptional in Left Wing parties."

On the occasion of the visit of the Society's President, Sir Josiah Stamp, to the Royal Dublin Society, the Statistical and Social Enquiry Society of Ireland arranged a luncheon in his honour, on the 83rd anniversary of the Society, which was formed on the 22nd November, 1847.

An influential company assembled at the Shelbourne Hotel, including, in addition to a large proportion of the Society's membership, many prominent members of the Government and Civil Service, and representatives of Banking and Finance.

The President, Mr. S. Eason, said that it was the first social function of the kind ever held in the history of the Society, and Sir Josiah replied that he regarded the occasion as a compliment to the elder sister society in London, and spoke at some length upon the present position of those statistical enquiries which fall uniquely within the sphere of the two Societies, and of the growing importance which their work had in the national life. He spoke also of the many developments of statistics since the formation of the Societies, and also of the growing dependence of economic science upon their work for its development. He made a special plea for reasonable liberty for all public servants who were handling statistical material to be set free from expressed or implied inhibitions, subject to the reasonable safeguard on grounds of policy of their respective departments.

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The British Association for the Advancement of Science, whose Centenary Meeting is to be held in London next September (23-30), has asked us to make known to Fellows that a large body of representative scientists from the Dominions and foreign countries is expected to attend, and that the Association will be deeply grateful for any assistance in securing or providing hospitality for these representatives. It should be added that offers of hospitality will be doubly welcome if they are received before Easter.

We are asked to announce that, in accordance with Article 6 of the Rudolf Funke Foundation, the Institut für Weltwirtschaft und Seeverkehr at the University of Kiel will award a prize for a thesis on the following subject :

*The International Inter-Relationship of Economic Fluctuations.*

The prize is open for competition to any individual research-worker, to any group of research-workers, or to any institution. The winner will be awarded the Rudolf Funke Prize of Rm. 18,000, and the Rudolf Funke gold medal. The latest date for sending in essays is December 31, 1932. The judges have been selected from

among eminent economists of five nations—Germany, France, Great Britain, Denmark, and the United States—and three, namely Professors Aftalion, Wesley Mitchell, and Wagemann, are Honorary Fellows of this Society. Full particulars of the conditions of competition and the lines of treatment laid down are given in the leaflet received here, and will be imparted to enquirers on receipt of a stamped addressed envelope; or application can be made direct to the Institute at Kiel.

The Study Group Society held its first meeting of the current session on October 14, 1930, when the Chairman, Mr. A. P. L. Gordon, addressed the Group on "Statistics in Relation to Advertising."

At the second meeting Mr. Colin Clark opened a general discussion on "New Work on Wholesale and Retail Prices." A resolution was carried that a special research committee of the Group should be appointed to investigate wholesale and retail prices with particular reference to those aspects found to be insufficiently surveyed by work already done or in progress.

The December meeting was held in conjunction with the Institute of Actuaries Students' Society at Staple Inn Hall on December 1, 1930. Mr. A. M. Southall of the Study Group, addressed an audience numbering well over 100 on "The Future of the Rate of Interest." A keen and critical discussion followed. The Study Group appreciated the hospitality of the Actuaries Students' Society and the fact that Mr. H. M. Trouncer, F.I.A., President of the Institute of Actuaries, took the Chair. It is hoped that a similarly successful meeting may be held at the invitation of the Study Group during next Session.

On January 6, 1931, Miss I. Douglas read a paper on the possibilities and value of a "Census of Distribution" in this country, in which the information obtained recently in the United States from a census of retail stores and shops was contrasted with the very inadequate data available for the British Isles. A brisk discussion followed. Mr. H. C. Craft will read a paper at the February meeting on "Foreign Trade Statistics," and Dr. J. O. Irwin will open a discussion at the March meeting on "Is the Universe Statistical?"

The Study Group would warmly welcome the attendance of all interested in the work which the Group is doing, and intending members are invited to communicate with the Hon. Sec. at 9, Adelphi Terrace.

## OBITUARY.

## HERBERT EDWARD SOPER.

HERBERT EDWARD SOPER, son of Francis Lesiter Soper, of London, and Mary Ann, *née* Blackwell, of Oxford, was born at Hampstead on September 6th, 1865. His father, one of a large family left ill-provided for, earned his own living from boyhood, teaching by day and attending evening classes at University College. He subsequently became a master at Dr. Heldenmaier's school at Worksop, the first school in England to be conducted on Pestalozzi's lines. Francis Lesiter Soper was a man of strong character with an insatiable desire for knowledge; after his marriage in 1855 (his wife was a pupil in the Worksop school) he took over a school at Margate, but his intellectual curiosity was unsatisfied and he came to London, entering into partnership with a publisher of books on botany and natural history subjects. Although his main interests were botany and natural history—he became a fellow of the Linnean Society and helped to found a literary and scientific society—he was fond of and had some knowledge of mathematics.

Herbert Soper was first sent to Highgate School, but the curriculum was too exclusively "classical" to suit him, and after a term he was transferred to St. Paul's. Henceforward he was successful both at work and play. Going up to Trinity with a foundation scholarship, he not only graduated as fourteenth Wrangler in the Tripos of 1887 (the year in which another of our Guy Medallists, Mr. A. W. Flux, was Senior Wrangler), but was awarded a running blue, and represented his university in two events. Soper spent two more years at Cambridge. In the first he took the second part of the Mathematical Tripos (he was awarded a second class). The second he spent in the Cavendish Laboratory and the Engineering Workshops. After coming down he coached pupils for scholarships (one, at least, of his pupils has since gained a leading place in science—Mr. Bertrand Russell). He combined coaching with study at the Central Technical Institute under Professor Ayrton (the son, it will be seen, repeated the practice of the father), and this led to acquaintance with Mr. Hamilton Kilgour, Electrical Engineer of the Borough of Cheltenham, where ten years of Soper's life were spent. He had helped Mr. Kilgour to draw the plans of the Cheltenham Electric Works and, in 1894, Mr. Kilgour persuaded him to



resign a master-ship he had obtained at Weymouth College and to come to Cheltenham as his assistant. At Cheltenham he not only worked hard and successfully as assistant and then chief assistant electrical engineer, but taught electro-technics in the Municipal School and looked after the private pupils of the Borough Engineer. In 1905 he went to India to supervise the erection of the power-station and tramway system of Cawnpore. On his return to England at the end of 1907 his association with statistics began. "I studied the mathematical theory of statistics"—he writes in a letter of 1911—"at University College under Professor Pearson, for the reason partly that I wished to keep up my mathematical reading (in which engineering gives small scope), and partly also that I was very much captivated with so practical an application of higher mathematics." For the remaining twenty-three years of his life, statistics were Soper's principal interest. He worked at University College down to the war; at first he collaborated with the late Charles Goring on the anthropometry of criminals, but in 1913 his first separate paper, on the Probable Error of a Coefficient of Correlation to a second Approximation, appeared in *Biometrika*.

That a man who had begun life a wrangler and a blue should twenty-seven years later be neither a judge nor a bishop, not even a public school head-master, implies that he differed very much for better or worse from the average Englishman. It is therefore not surprising that the kind of national service he was well fitted to perform in the war was irksome to Soper; he yearned for something more physically strenuous, and became a member of a Labour corps. One anecdote of this service is so characteristic that I must tell it. He served at Boulogne, and one day volunteers were asked to unload a wreck (in bad weather). Of course Soper volunteered; the weather grew worse and the volunteers were ordered to be re-embarked; Soper was missing. He had wandered off to examine the ship's engine-room. "After all," he said, "it wouldn't have mattered if they had left me. I could have swum ashore." (He was over fifty, and the conditions were such that *volunteers* were called for.) After the war, Soper went back to the Galton Laboratory, and in 1922 *Frequency Arrays* was published. Shortly after that my personal acquaintance with him began.

In 1923 it was arranged that Soper should work in Dr. Brownlee's department at the National Institute of Medical Research. Dr. Brownlee had conceived a scheme for providing medical laboratory workers, indeed the whole medical profession, with a *vade mecum* not only of statistical but of mathematical methods, and his idea was that a mathematician would not only codify biometry but would also give mathematical form to Brownlee's own doctrines.

Soper was the mathematician chosen. The scheme was promising, but made insufficient allowance for personal equation. Brownlee, like many original-minded men, was not much interested in other men's work, while the materials for interpreting his own dreams, he vouchsafed an interpreter, were similar to those provided by King Nebuchadnezzar for *his* experts. Soper being a tender-minded scholar, not a Daniel, was hurt by the indifference with which Brownlee regarded his codifications of the Pearsonian type-curves, for instance, and attributed his inability to understand Brownlee's ideas wholly to his own obtuseness. Some, I hope a good deal, of the product of the scheme exists in Soper's beautiful manuscript and will be published, but the *vade mecum* itself will never appear.

As a fellow-worker at the National Institute I grew conscious of the little upright figure, usually sitting in the most uncomfortable corner of the library, and began to pass the time of day. Like all enthusiastic lovers of mathematics who have neither the natural gift nor have had the intensive training needed to produce a *pukka* mathematician, I was horribly in awe of Soper. I had read and re-read with admiration *Frequency Arrays*, and found it very hard to make advances to its author. Gradually, however, the ice thawed, and then I discovered that the difficulties were just the converse of what I felt they *ought* to be. One had no need to fear one's own vanity would be wounded by a contemptuous exposure of one's incompetence, but the greatest difficulty, amounting to impossibility, in convincing Soper that all his colleagues regarded him as their intellectual superior. I think, however, that, before Brownlee's premature death in 1927, in consequence of which Soper passed nominally under my leadership, he had realized part of the truth. I had partly convinced him that if he would only do exactly what he pleased and let me and my other colleagues come to him with our mathematical troubles he would *far* more than earn his salary. The success was only partial. Not infrequently he would decline to accept his salary, on the ground that he had not done any work (actually I have never met anybody who worked with more dæmonic energy); while his modesty made it almost impossible for him not to hold that "I think this is splendid, Soper; I have neither the brains nor the knowledge to criticize it," was identically equal to "I think this is dull and I am not going to bother to criticize it." There were, indeed, times when his self-abnegation hurt; it made one suspect that one was a mere quack, unfit to have as an associate a first-rate man. Yet, on the whole, I think the last three or four years of his life were happy. Very gradually he was tempted out of his shell and even induced to drink tea with us, and by the time we moved from the National Institute into the School of Hygiene

and Tropical Medicine he had become quite clubbable; *always* came to tea, often could be persuaded to take part in frivolous discussions and enjoyed little leg-pulls, as when, in allusion to his pessimistic views on most efforts at sampling, a suggested programme of music for one of our gatherings included the item—"Ten thousand times ten thousand—or the Sample that satisfied Soper."

His influence was much greater than he would ever have admitted. I do not mean only through his suggestive criticisms of and clarifications of our ideas of herd-mortality, the periodicity of measles and such other problems as he directly attacked, but his personal influence. Nobody has ever been closely associated with a scholar and a gentleman—which is what Soper essentially was—without being the better for it. Not one of us but has been the object of acts of personal generosity, and his influence extended beyond the range of his personal intimates. It might be expected that a shy mathematician would not be likely to be a successful teacher of the rudiments of statistics to "doctors." Actually he was a popular and successful teacher. He had, of course, to be allowed to go his own way; he could not be "fitted in." But when he was given his own territory, he would take endless and successful pains to make its geography clear to men who would have turned pale at the mention of the binomial theorem and fainted at the sight of  $dy/dx$ . During the last months of his life his modesty deepened at times into depression, but I believe that his knowledge of the affectionate respect in which we all held him gave him comfort and, as an officer of the Society, I am glad to be able to say with complete confidence that the award of the Guy Medal, which he has not lived to receive, gave him real pleasure.

He was seriously ill before the Summer Vacation began, and, after many weeks of suffering borne with characteristic gentleness, he died on September 10th, 1930.

Soper's output of published work was small. He contributed four papers to *Biometrika*, an article to the *Field* (on the grading of athletic performance) which had considerable influence in athletic circles abroad, and three papers to our own *Journal*, of which the most important is his paper on the Interpretation of Periodicity in Disease Prevalence which was read before the Society in 1929.

All these papers are valuable, but the work which will surely keep his memory green when those who knew and loved him are forgotten is *Frequency Arrays*. The Royal Statistical Society has at least the credit of proving an exception to the rule that the prophet is not without honour save in his own country. It is true that in other English journals, *Frequency Arrays* was spoken of politely. But the only notice in an English journal which I have seen con-

veying the impression that Soper had made a first-rate contribution to statistical methodology appeared in our *Journal* over the initials L. I. (1923, LXXXVI, 67), and the Council in awarding the Guy Medal made mention of this tract. Continental statisticians did not confine themselves to vague politeness. The French Academy of Sciences awarded Soper a Montyon Prize, and the late Professor Tschuprow wrote a review (*Nordisk Statistisk Tidskrift*, 1924, III, 414-17) in which he characterized the tract not, as some other reviewers hinted, as an ingenious way of setting out what everybody knew before, but as "einen namhaften Beitrag zur formal mathematischen Ausrüstung des Statistikers." Although in the paper in our *Journal* (1926, LXXXIX, 326) on the moments of the hypergeometric series, Soper himself gave an illustration of the power of his calculus, it is fitting briefly to recall the essence of his thought. What Soper calls an array is essentially a generating function, and generating functions were introduced by Laplace, in whose notation, if  $F(x)$  be a number one constructs

$$\begin{array}{c} x = x \\ \sum_{r=0} F(x)t^r, \\ x = 0 \end{array}$$

and by carrying out the summation Laplace was often able to set out the value of  $F(x)$  for all integral values of  $x$  as the coefficient of  $t^x$  in the expansion of a compact function of  $t$ . The Scandinavian School of Thiele, Charlier, Wicksell and others have used the method in statistics, and in England the late Major P. A. Macmahon developed it extensively for the purposes of his researches in Combinatory Analysis, the direct relevance of which to the higher theory of statistics has recently been pointed out by Dr. Fisher and by Dr. Wishart.\*

Suppose that in a certain universal the distribution of certain characters  $A_1, A_2, A_3$ , etc. is specified by  $Sp_i A_i$  where  $Sp_i = 1$ , then  $(Sp_i A_i)^n$  would array the frequency of occurrence of the several combinations of characters in samples of  $n$  drawn (with replacement) from the universe, in the sense that the coefficient of each product of  $A$ 's would assign the expected frequency of samples so constituted. Suppose there are several universals for each of which the same set of characters is specified, but attached to each character-symbol the value of  $p$  varies from one to the other universe, i.e. we have  $Sp'_i A_i, Sp''_i A_i$ , etc. characterizing the different universals, then writing these  $U_1, U_2$ , etc., the array of the characters in a sample of  $m$  drawn from the first,  $n$  drawn from the second,  $p$  drawn

\* I have been interested in an amateurish way in this subject for some years and tried to excite Soper's enthusiasm for Combinatory Analysis, but he disliked Macmahon's notation.

from the third universal (with replacement) is  $U_1^m U_2^n U_3^p \dots$ . The character-symbol may, of course, represent any character. We might, for instance, draw samples of different size from a universal  $U$  and its array would be  $Sp''s_i$ , where  $s_i$  is the symbol of a draw of  $i$ . Substituting  $U$  for  $s$  in this expression, we have arrayed the frequencies of total  $A_1$ , total  $A_2$ , etc. in the variously sized samples drawn. If we are only interested in certain characters, the substitution of unity for each of the character-symbols which does not interest us leaves us the array of those which do. Now suppose one is concerned with but a single character occurring in different measures in a universal and  $p_i A_i$  is the mathematical expectation of the occurrence of the measure  $i$  of the character  $A_1$ . Then if we substitute  $e^a$  for  $A_1$  and expand  $Sp_i e^{a_i}$  we see that the  $r$ th. moment of the distribution about the origin is the coefficient of  $a^r/r!$  in the expansion. When another character  $A_2$  is involved and we are concerned with the product  $A_1' A_2'$  we shall have a product  $e^{a_1'} e^{a_2'}$ , the expansion of which will again generate the several moments.

For instance. Suppose we write the binomial in the form  $\{1 + p(A - 1)\}^n$ .  $A$  being the character-symbol of a "success"; then the Poisson limit when  $p$  is very small but  $np$  finite and  $= m$  will be written  $e^{m(A-1)}$ , or expanding in powers of  $A$ ,  $e^{-m}(1 + mA + m^2 A^2/2! \dots)$ , now substitute  $e^a$  for  $A$  and our generating function is  $e^{m(e^a-1)}$ . The coefficient of  $a$  is  $m$ , so that the mean is  $m$ : therefore if we multiply by  $e^{-ma}$  we shall have the generating function of the moments referred to the mean, viz.  $e^{m(e^a-1-a)} = e^{m(e^a-1-a)}$ . From this by simple multiplication we can easily extract the second and next few moments of the distribution. It may be said that these results can be obtained by simple algebra without bothering to learn a new notation. They can; but using the notation we can obtain in two lines a result which is not obvious, viz. that if samples are drawn with replacement from a population enumerated under any headings with Poisson frequencies about a mean  $m$ , then the numbers in each separate cell of the classification vary in complete independence one of another, with Poisson frequencies about their individual mean values. We are told that the array of "number in sample" (symbol,  $s$ ) is  $e^{m(s-1)}$ . Replace  $s$  by  $U$ , the character-symbols of which  $A_1, A_2 \dots$  represent cell-contents, and we have  $e^{m(U-1)} = e^{m(p_1 A_1 + p_2 A_2 + \dots - 1)} = e^{mp_1(A_1-1)} e^{mp_2(A_2-1)} \dots$  and the proposition is proved. It leads immediately to a beautiful demonstration of Professor Pearson's Goodness of Fit test—characteristically relegated by Soper to a footnote. The example I have taken illustrates the power and elegance of the method and perhaps suggests its limitations. Pro-

fessor Tschuprow in his critique noted that when one had to deal not with independent variables but with a nexus of correlated sets, Soper's method was less satisfactory. It is true that he handled the problem of sampling without replacement very skilfully, but, as Tschuprow indicated, much remained to be done. In Tschuprow's opinion, development was required in the directions of "(1) The deduction of the laws of distribution not only of the sums (or means) but also of the other symmetrical functions of the chance values which the variables in the course of the experiments made upon them might assume, from the laws of distribution or of correlation of the variables. (2) The treatment of the problem of correlated experiments (*verbundene Versuche*)."

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Perhaps enough has been said to remind some and to inform others—even in eight years young men may have grown up who are interested in the theory of statistics but have never been advised to read *Frequency Arrays*—that Soper provided a method the value of which has not yet been appreciated by his countrymen. The gracious memory of his character must fade as the very few who knew him intimately pass away, but his work will live; he is sure of the immortality which he would most have valued, the appreciation in each successive generation of a small number of kindred spirits having a passion for the logical expression of statistical ideas.

M. GREENWOOD.

#### JOHN HOOPER.

CLOSE upon the notification of his election as a Member of the International Institute of Statistics comes the news of the unexpected death of John Hooper, after almost thirty years spent in the service of the State on statistical work. Of recent years he had not the time to spare from official duties to enable him to attend Conferences of International Statisticians and meet the experts of other countries engaged in labours similar to his own. Although for this reason he did not have many opportunities of forming personal acquaintanceships amongst foreign statisticians, his name was widely known and appreciated by them.

It was only a few weeks before his death that John Hooper vacated the Chair after his period of office as President of the Statistical and Social Inquiry Society of Ireland. From the time he became a member of the Council of the Society he infused life

\* *Nordisk Statistisk Tidsskrift*, 1924, Vol. III, p. 417.

and vigour into its proceedings, and a paper read by Hooper or his observations on papers read by other members always attracted wide attention. He became a member of the Royal Statistical Society in 1925 and took great interest in its work, though it was difficult for him to attend its meetings, which were held in London. Most unassuming and retiring in disposition, his prominence was chiefly due to the outstanding quality of his official work. He was an ideal Director of a Government Statistical Office, combining in exceptional measure those qualities which go to make the administrative and the technical statistician. But for his untimely death it was intended that the degree of Doctor of Economic Science should be conferred upon him by the National University in recognition of his statistical work for the Irish Free State, and in particular for a masterly analysis of the several volumes of the Census of Population for which he was responsible.

Born in 1878, Hooper graduated in 1898 at the National University (then Royal University) of Ireland, taking first place with first-class honours in Mathematical Science. In 1901 he secured a high place in the examination for Class 1 Clerkships in the Civil Service, and in 1902 commenced official statistical work in the Department of Agriculture and Technical Instruction for Ireland. In 1917 he was appointed Head of the Statistics Branch of that Department, and remained there until 1923, when he was appointed Director of Statistics in the Department of Industry and Commerce of the newly-formed Irish Free State Government. His first duty was to act as Chairman of the Committee which set up the present series of Cost of Living Index-numbers and to prepare an organisation for compiling and publishing the Economic Statistics of the country. In 1926 the work of the Census of Population was assigned to him, and in the same year he undertook a Census of Industrial Production. In that year also he was responsible for the preparation of a comprehensive Statistics Act, subsequently adopted by the Oireachtas. All official statistics, except Vital Statistics, were put under Mr. Hooper's charge. He believed in the centralisation of all Government statistics, and his general policy on statistical matters was always guided towards that end. His field of activities thus included Census of Population, Censuses of Industrial and Agricultural Production, Statistics relating to Trade, Agriculture, Transport, Labour (including Cost of Living), Migration, and Finance.

He had no leisure for personal work, as all his time and energies were taken up in connection with his official duties. Amongst so much work of exceptional quality it is difficult to single out particular items for special notice, but reference may be made to the setting up of two sets of Sample Statistics during the war (in 1917-18 for

estimating every second month the numbers of live stock in Ireland, and in 1918 to correct a serious understatement in the returns of tillage area), and to his Reports on Trade Statistics in 1925 and Agricultural Statistics 1847-1926.

His Reports bear the stamp of originality; he endeavoured to make statistics attractive to the public and realized the worth of properly presented statistical tables accompanied by a readable analysis; he had the rare gift of making his statistics live. Such qualities are of special value in a new State faced with new economic problems, and the high merits of Mr. Hooper's work are a measure of the loss which his country has sustained through his passing.



# STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

## UNITED KINGDOM—

*Auctioneers' and Estate Agents' Institute of the United Kingdom, Journal—*

*August, 1930*—Recent developments in fruit-growing (with discussion): *H. V. Taylor*.

*September, 1930*—Presidential address (on agriculture): *G. F. Page*.

*December, 1930*—Defects in the Rating and Valuation Acts of 1925 and 1930 (with discussion): *P. M. Faraday*.

*Bankers' Magazine—*

*August, 1930*—The bank balance sheets. Bankers and fiscal policy.

*October, 1930*—Silver: a general survey (with charts): *A. J. Liveridge*. Can credit be created?: *R. Reisch*. Socialism and capital: *David Eccles*. Bankers and credit underwriters: *P. G. Colmer*.

*November, 1930*—Gold shortage and industrial depression. The American banking system in transition: *W. H. Wynne*.

*Biometrika, July, 1930*—Tables for determining the volumes of a bi-variate normal surface. A theory of the sampling distribution of standard deviations: *T. Kondo*. A statistical study of certain anthropometric measurements from Sweden: *P. C. Mahalanobis*. The derivation of certain high order sampling product moments from a normal population: *John Wishart*.

*Economic Journal—*

*June, 1930*—British foreign investments in 1928: *Sir Robert Kindersley*. The new economic policy of the Soviet Union: *Calvin Hoover*. The indeterminateness of wages: *J. R. Hicks*. Labour transference and unemployment: *G. C. Allen*.

*September, 1930*—Problems of rationalization: a discussion: *D. H. Macgregor, J. Ryan*, and others. Marshall on rent: a reply to Professor Ogilvie: *M. Tappan Holland*. The statistical derivation of demand curves: *A. C. Pigou*. The artificial control of raw material supplies: *J. W. F. Rowe*. Some economic and social consequences of Russian communism: *Calvin Hoover*.

*December, 1930*—Rationalization and technological unemployment: *T. E. Gregory*. Machinery replacement in the cotton trade: *John Ryan*. The efficiency of American manufacturing industry: *J. Jewkes*. Margin and profits in retail trade in the United States: *M. P. McNair*. Inheritance: a sample inquiry: *Sir Josiah Stamp*.

## UNITED KINGDOM—Contd.

*Economica*, November, 1930—The migration of labour into the Glamorganshire coalfield (1861–1911): *Brinley Thomas*.

*Eugenics Review*, October, 1930—Eugenics without Mendelism: *J. F. Roberts*. Twins and orphans: *A. H. Winfield*.

*Faculty of Actuaries, Transactions*—

*Part II*, 1930—Recent developments in disability insurance in the United States of America. Abstract of discussion: *E. B. Whittaker*.

*Part III*, 1930—The compilation of price index-numbers and yield statistics relative to stock exchange securities. Abstract of discussion: *A. C. Murray*.

*Ministry of Agriculture, Journal*—

September, 1930—An eighteenth-century book farmer: *Cuthbert Clarke*.

October, 1930—Soil surveys and their utilization: *Linwood L. Lee*.

November, 1930—Improvement of farm labour: *W. R. Dunlop*.

*Quarterly Journal of Mathematics*—

October, 1930—A note on hypergeometric series: *A. L. Dixon*.

December, 1930—Convergence and Summability criteria for Fourier series: *J. J. Gergen*. The exponential function in linear algebras: *P. Dienes*.

*Royal Institution of Great Britain, Proceedings, Part II*, 1930—Unemployment: *Henry Clay*.

*Royal Meteorological Society, Quarterly Journal*, October, 1930—Irregularities in the annual variation of the temperature of London: *C. E. O. Brooks* and *S. T. A. Mirrlees*.

*Royal Philosophical Society of Glasgow*, 1930—Rationalization: *J. R. Richmond*. Science in agriculture: *W. G. Paterson*. The production and distribution of electric power in Scotland: *G. W. O. Howe*.

*Secretary, August*, 1930—Building societies: *M. T. Cordingley*.

*Surveyors' Institution, Journal*—

September, 1930—Land reclamation: *P. G. Stapledon*.

October, 1930—Principles relating to valuations considered from an economic standpoint: *N. P. Risdon*.

## INDIA—

*East India Association, Journal*—

July, 1930—India's progress and India's poverty: *Sir Alfred Chatterton*.

October, 1930—The report of the Simon Commission: *Marquess of Zetland*. The report of the Simon Commission: *V. S. Srinivasa Sastri*.

*Indian Journal of Economics*—

July, 1930—The cotton mill industry of the Madras Presidency: *M. G. Ranga*. Economics of the foreign trade of India: *S. C. Bose*.

## UNITED STATES—

*Actuarial Society of America, Transactions, May, 1930*—An extension of the methods of graduation by interpolation: *W. A. Jenkins*. Constant extra occupational premiums: *W. G. Bowerman*. Joint life annuity values by the combined annuity mortality table: *R. Henderson*.

*American Academy of Political and Social Science, Annals*—

*September, 1930*—Post-war progress in child welfare. (Whole number.)

*November, 1930*—China (whole number). A number of articles by various authors, including:—China in the remaking; The textile industry of China; Chinese money and banking; Present economic and political position of Great Britain in China.

*American Economic Review*—

*September, 1930*—New York utility regulation: *John Bauer*. Static and dynamic economics: *Simon Kuznets*. Unemployment and technical progress in commercial printing: *E. F. Baker*. Tariff act of 1930: *Abraham Berglund*.

*December, 1930*—Economics of accountancy. *Irving Fisher*. Motor and rail carriers in Great Britain: *G. S. Peterson*. Psychological yardsticks for economic values: *J. P. Guilford*.

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*Annals of Mathematical Statistics, August, 1930*—Distribution of the means of samples of  $n$  drawn at random from a population represented by a Gram-Charlier series: *G. A. Baker*. The use of linear functions to detect hidden periods in data separated into small sets: *E. L. Dodd*. A synopsis of elementary mathematical statistics: *B. L. Shook*. Fundamentals of the theory of sampling: *Editorial*.

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*June, 1930*—Effect of noise upon efficiency. Standard of living of Ford employees in Detroit. Apartment house construction in American cities.

*July, 1930*—Variations in employment trends of male and female workers. Automobile industry in Germany. Hours and earnings in the boot and shoe industry.

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*August, 1930*—The diffusion of stock ownership in the United States: *G. C. Means*. Demand curves in theory and in practice: *E. W. Gilboy*. Factors in industrial integration: *John Jewkes*. Moore's synthetic economics: *Mordecai Ezekiel*.

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*November, 1930*—The general course of wheat prices in France, 1350-1788: *A. P. Usher*. Statistical background of the crisis of 1857: *A. H. Cole*. Business volumes during periods of decline and recovery: *J. B. Hubbard*.

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*July, 1930*—La técnica del Derecho internacional publico: *L. M. M. Quintana*. Topicos monetarios y bancarios de actualidad en el orden internacional: *Julio Eroidé*.

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*August, 1930*—Las ventas de cereales a fijar precio: *A. J. Maresca.*

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*August, 1930* (Supplement)—The economics of Australian transport (various articles).

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*August, 1930*—L'économie belge depuis la stabilisation monétaire: *Fernand Baudhuin.* La méthode de calcul des variations saisonnières et des courbes cycliques: *L. H. Dupriez.* Le problème du pétrole au Mexique: *A. Dorff.*

*November, 1930*—Le mouvement des chambres de compensation envisagé comme indice de l'activité générale: *Dupriez (L. H.) et Roger (Ch.).*

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September-October, 1930—Les théories économiques du salaire : *François Simiand*. Après les conférences agraires de l'Europe centrale : *Francis Delaisi*.

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Heft 3, 1930—Moral und Moralstatistik : *Johannes Muller*. Deutschlands weltwirtschaftliche Verflechtung und die Aufgaben unserer Handelsstatistik : *Cora Berliner*. Zusammenarbeit der volkswirtschaftlichen und betriebswirtschaftlichen Statistik : *W. Morgenroth*. Die Wanderungen über die Deutschen Reichsgrenzen im letzten Jahrhundert : *F. Burgdorfer*.

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*Blätter für Versicherungs-Mathematik*, October, 1930—Grundlagen zur Invaliditätsversicherung in Verbindung mit einer doppelt abgestuften Sterbetafel: *R. Schönwiese*. Ein Mass der Güte für die Sterbetafel: *Emil Gumbel*.

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—*Teil B*—Neuerscheinungen zur Konjunkturforschung.

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*Sonderheft 20*, 1930—Die Zukunft des Roggens: *N. Jasny*.

*Weltwirtschaftliches Archiv*, October 1930—Die Zukunft des Imperialismus: *Arthur Salz*. Die Theorie der komparativen Kosten und ihre Auswertung für die Begründung des Freihandels: *Gottfried Haberler*. Das Gesetz der komparativen Kosten—das Gesetz der komparativen Kaufkraft: *Gerhard Colc*. Die finanzpolitische Bedeutung der Zölle: *R. B. Kappeli*. Das Problem der interlokalen Bankenkonzentration in den Vereinigten Staaten von Amerika: *Thomas Balogh*.

*Zeitschrift für die gesamte Versicherungs-Wissenschaft*, October, 1930—Bausparkassen und Versicherungsaufsicht: *Karl Bernard*. Die neuen Reformen der deutschen Arbeitslosen- und Krankenversicherung: *W. Dobbernack*.

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*Journal de la Société Hongroise de Statistique*—Nos. 1-2, 1930—Les tables de mortalité de la Hongrie: *T. Szél*. La situation sociale et les conditions de travail de la femme active en Hongrie: *Georges Gortay*. La monnaie russe pendant et après la guerre mondiale: *G. Tagan*.

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*Annali di Economia*, July, 1930—Le relazioni commerciali fra l'Italia e l'Impero Britannico: *G. Mortara*. Osservazioni sopra le relazioni tra gli economisti italiani e gli economisti inglesi: *G. Del Vecchio*. Società ed economia nell'India antica e moderna: *B. K. Surkar*.

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No. 3, 1930—La disoccupazione degli intellettuali—cause e remedi: *G. di Giacomo*. La disoccupazione negli Stati Uniti: *R. F. Wagner*. La disoccupazione in Norvegia: *J. Hvidsten*. Alcuni aspetti dell'assicurazione sociale in Gran Bretagna nei riguardi delle donne appartenenti alle classi lavoratrici: *E. Martelli*. Statistica nazionale e internazionale delle migrazioni: *L. Ferenczi*. L'Assicurazione delle malattie professionali in Germania: *L. Teleky*. (A

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Supplement contains these articles in the original French, English, Norwegian, and German.)

No. 5, 1930—I prestiti esteri: *Alberto De' Stefani*. Le origini e i compiti dell' Ufficio delle assicurazioni del Reich: *H. Schaffer*. La recente riforma dell'assicurazione malattia in Germania: *F. Stier-Somlo*. (A Supplement contains these articles in the original French and German.)

*La Riforma Sociale*—

September–October, 1930—Le open-market operations del "Federal Reserve System": *A. Martinenghi*. Quale deve essere il compito dell' agricoltore, dell' industriale, del commerciante: *E. Ottolenghi*. Intorno al numero delle banche ed ai loro costi di gestione: *L. E.*

November–December, 1930—Scienza, critica e realtà economica: *P. Jannaccone*. Nota intorno ad alcuni problemi sulla repartizione dell' oro: *Attilio Cabiati*.

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July, 1930—Lo spirito di lucro comme movente dell' attività economica: *J. G. Kietzschmann*. Sugli effetti delle riparazioni tedesche: *A. Cabiati*.

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*Fasc. 2*, 1930—Les travaux de statistique de la section statistique du Bureau International du Travail: *J. W. Nizon*. Quelques déductions du "principe de la population" de Malthus: *L. Hersch*. Méthode d'un rapprochement économique entre les différents pays: *L. Sommer*.

*Fasc. 3*, 1930—Die Personalversicherung als Ergänzung der statlichen Sozialversicherung: *Karl Greiner*. Altersaufbau und Sterblichkeitsmessung: *E. Zwinggi*.

INTERNATIONAL—

*International Cotton Bulletin*, October-November, 1930—How gold scarcity reacts on the cotton industries of the world: *E. E. Canney*.

*International Labour Review*—

*August*, 1930—Wages policy and the gold standard in Great Britain: *J. R. Bellerby* and *K. S. Isles*. The agrarian structure of Poland and France from the point of view of emigration: *Z. Ludkiewicz*.

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## LIST OF ADDITIONS TO THE LIBRARY.

Since the issue of Part IV, 1930, the Society has received the publications enumerated below:—

## I.—OFFICIAL PUBLICATIONS.

## (a) United Kingdom and its several Divisions.

## United Kingdom—

*Empire Marketing Board.* Statistics and Intelligence Branch. Production and trade of the following countries:—Canada, 29 pp.; Ceylon, 19 pp.; Newfoundland, 18 pp.; New Zealand, 22 pp.; Indian Empire, 27 pp.; Union of South Africa, 24 pp. London, H.M.S.O., 1930. 9½" x 7¼". 2d. each. (The Board.)

*Overseas Trade, Department of—*

Reports on commercial, financial, and economic conditions as follows: Bulgaria (July 1930), 2s.; China, with an annex on Manchuria (Aug. 1930), 2s. 6d.; Ecuador (Sept. 1930), 1s. 6d.; French West Africa (1928–30), 1s. 6d.; Germany (July 1930), 4s. 6d.; British trade in India (1929–30), 3s. 6d.; Japan (June 1930), 2s. 6d., Spanish zone of Morocco; Tangier zone of Morocco; Persia (March 1930), 1s. 6d.; Philippine Islands (1927–30), 1s. 6d.; Roumania (May 1930), 1s.; Spain (June 1930), 2s.; Syria (1930), 1s.; Turkey (April 1930), 1s. 9d.; Uruguay (Aug. 1930), 1s. 6d.; Yugoslavia, 1s. London, H.M.S.O., 1930. 9½" x 6". (The Department.)

## England and Wales—

*Health, Ministry of—*

Reports on public health and medical subjects, No. 58—A study of the nasopharyngeal bacterial flora of a group of the Manchester population during the period July 1925 to September 1927. 29 pp. 6d. No. 59—Report on cancer of the lip, tongue and skin. 121 pp. 2s. No. 60—The effect on foods of fumigation with hydrogen cyanide. 32 pp. 6d. No. 61—A disease of parrots communicable to man (Psittacosis). 132 pp. 2s. 6d. London: H.M.S.O., 1930. (The Ministry.)

Circular No. 1136. Cancer—VII. 10 pp. London: H.M.S.O., 1930. 9½" x 6". (Id.)

*Departmental Committee on Maternity and Morbidity.* Interim report. 9½" x 6"; 151 pp. London: H.M.S.O., 1930. 2s. (Id.)

*Industrial Health Research Board—*

Sickness amongst operatives in Lancashire cotton-spinning mills (with special reference to the cardroom). *A. Bradford Hill.* 9½" x 6"; xi + 91 pp. London: H.M.S.O., 1930. 1s. 6d. (The Publishers.)

The atmospheric conditions in pithead baths. *H. M. Vernon and T. Bradford.* 9½" x 6"; 39 pp. London: H.M.S.O., 1930. (The Board.)

## (b) India, Dominions, and Protectorates.

## India—

*Meteorological Department—*

*Memoirs.* Vol. XXV. Part V. Discussion of results of sounding balloon ascents at Agra during the period July 1925 to March 1928 and some allied questions. Pp. 163–93. Calcutta, 1930. 3s. 6d. (The Department.)

(b) India, Dominions, and Protectorates—*Contd.*India—*Contd.*

## Meteorological Department—

Scientific notes. Vol. II. No. 13—Atmospheric instability at Agra associated with a western disturbance. Pp. 21–25. 1s. 6d. No. 14—Horizontal atmospheric visibility at Agra. Pp. 27–36. 8d. Calcutta, 1930. (*Id.*)

District Gazetteers. Madras. Statistical appendices for North Arcot Dist. Vol. II. vi + 87 pp. Rs. 2; Guntur Dist. Vol. II. vi + 79 pp. 1 R. 12 as.; Rammed Dist. Vol. II. vi + 66 pp. 1 R. 8 as.; Nellore. Vol. II. vi + 71 pp. 1 R. 10 as. Madras. 9½" × 5½". 1929.

United Provinces of Agra and Oudh. Supplementary notes and statistics. Vol. XIII. Ghazipur Dist. 12 – xl pp. Allahabad, 1929. 12 as.

## Canada —

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## Dominion Bureau of Statistics—

Special report on order of birth of children born in 1925 (registration area as of 1921). 9½" × 6½"; 40 pp. Ottawa, 1930. (The Bureau.)

Agricultural branch. Live-stock and animal products statistics, 1929. 9½" × 6½"; 117 pp. Ottawa, 1930. 25 cents. (*Id.*)

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## Austria —

Ort-verzeichnis des Burgenlandes. Bearbeitet auf Grund der Ergebnisse der Volkszählung vom 7 März 1923. 11" × 7½"; 32 pp. Wien, 1925.

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Annaes do Quinto Congresso Brasileiro de Hygiene. Vol. II. Sessões plenárias. 10½" × 7½"; 612 pp. Rio de Janeiro, 1930.

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I. Valeurs caractéristiques des courbes de fréquences de la pression atmosphérique et lignes isobares généralisées en Europe. 12½" 9¼"; 56 pp. Prague, 1927. 25 Kc. (The Statistical Office.)

II. Manuel de l'analyse harmonique. 12½" x 9¼"; 98 pp. Prague, 1929. 50 Kc. (*Id.*)

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Financial Committee. Report to the Council on the work of the 39th session. 13" × 8½"; 11 pp. Geneva, 1930. (*Id.*)

— Work and function of the Committee. 13" × 8½"; 7 pp. Geneva, 1930. (*Id.*)

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Gold Delegation of the Financial Committee. Interim report. 10½" × 7½"; 120 pp. Geneva, 1930. 3s. (*Id.*)

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## (d) International—Contd.

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- International Conference on Treatment of Foreigners. 13"  $\times$  8 $\frac{1}{4}$ "; 3 pp. Geneva, 1930. (*Id.*)
- International Convention of November 3, 1923, relating to the simplification of customs formalities. Application of Article 10, pars. 6 and 8, and of Article II, No. 2, of this Convention.
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- Review of the economic aspects of several international industrial agreements. 10 $\frac{1}{4}$ "  $\times$  8"; 76 pp. Geneva, 1930. 2s. 6d. (*Id.*)
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- Proposals of the Economic Committee to serve as a basis for the future negotiations. 13" : 8 $\frac{1}{4}$ "; 5 pp. Geneva, 1930. (*Id.*)
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- Settlement of Bulgarian Refugees. 16th Report of the Commissioner of the League in Bulgaria. 13" : 8 $\frac{1}{4}$ "; 15 pp. Geneva, 1930. (*Id.*)
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- Veterinary questions. 13" : 8 $\frac{1}{4}$ "; 19 pp. Geneva, 1930. (*Id.*)

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- Bernstein (*S. A.*). The financial and economic results of the working of the Lena (Goldfields) Company, Ltd. 7½" 4½"; 36 pp. London: Blackfriars Press, 1930. (Mr. J. E. Dodsworth.)
- Berridge (*W. H.*). Unemployment: a problem of industry (1909 and 1930). New ed. 8½" x 5½"; xxvii + 514 pp. London, etc.: Longmans, Green & Co., 1930. 21s. (The Publishers.)
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- Carnegie Endowment for International Peace—  
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 Les grandes systèmes de politique internationale. *Prof. C. Dupois*. Les traités internationaux de l'Europe orientale. *Prof. Mirkin-Guetzevitch*. La conception du droit international chez les théologiens catholiques. *Rév. Père Yves du la Brière*. Le progrès de la justice internationale. *Prof. de Francquville*. 8½" x 5½". Paris: Carnegie Endowment, 1930. (The Publishers.)
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- Conférences de *Prof. P. Rerouvin*. 8½" x 5½". 24 leçons. Paris: Carnegie Endowment, 1930. (*Id.*)
- Division des relations internationales et de l'éducation—La guerre d'agression comme problème de droit international. *Prof. Unden*. L'Espagne, l'homme, et le peuple. *Prof. Vosler*. Démocratie française et démocratie allemande. *Prof. Vermeil*. 7½" x 4½". Paris: Carnegie Endowment, 1930. 4 francs. (*Id.*)
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## REVENUE OF THE UNITED KINGDOM.

*Net Produce in Quarters of 1930, and in Financial Years ended  
March 31, 1929-30, 1928-29, 1927-28, 1926-27.*

(000's omitted.)

QUARTERS, ended	March 31, 1930.	June 30, 1930.	Sept. 30, 1930.	Dec. 31, 1930.	Total for calendar year 1930.
	£	£	£	£	£
Customs .....	29,101	29,310	59,772	31,242	149,425
Excise .....	29,100	29,100	59,800	35,700	153,700
Stamps and Estate Duties.....	29,460	26,820	50,670	22,930	129,880
Land Tax, House Duty and Mineral Rights Duty .....	690	130	150	30	1,000
Postal Service .....	17,200	16,500	33,100	19,400	86,200
Telegraph Service .....					
Telephone Service .....					
Property and Income Tax, in- cluding Supertax.....	105,551	101,860	203,341	109,302	520,205
	203,356	32,119	73,341	23,816	332,632
Excess Profits Duties, etc.....	308,907	133,979	276,833	133,118	552,837
Corporation Profits Tax .....	2,240	—	—	—	2,240
Motor Vehicle Duties .....	16,794	4,360	8,028	2,572	31,754
Crown Lands .....	280	260	610	140	1,590
Interest on Sundry Loans .....	9,185	9,383	17,081	9,617	45,266
Miscellaneous and special re- ceipts .....	4,492	5,334	12,205	9,986	36,017
Appropriation from Rating Relief Suspense Account .....	—	—	16,000	—	16,000
Totals .....	345,896	133,359	330,757	155,733	965,704

YEARS, ended March 31,	1929-30.	1928-29.	1929-30 (compared with 1928-29).		Corresponding years.	
			Increase.	Decrease.	1927-28.	1926-27.
	£	£	£	£	£	£
Customs .....	119,888	118,972	916	—	111,620	107,515
Excise .....	127,500	134,000	—	6,500	139,200	132,978
Stamps and Estate Duties.....	105,440	110,630	—	5,190	104,340	92,070
Land Tax, House Duty and Mineral Rights Duty .....	880	840	40	—	780	880
Postal Service .....	68,100	65,300	2,800	—	38,250	35,600
Telegraph Service .....					6,100	5,900
Telephone Service .....					18,630	17,350
Property and Income Tax, in- cluding Supertax .....	421,808	429,742	3,756	11,690	418,940	392,293
	293,816	293,770	46	—	311,183	300,627
Excess Profits Duties, etc.....	715,624	723,312	3,802	11,690	730,123	692,920
Corporation Profits Tax .....	2,250	850	350	—	1,780	4,500
Motor Vehicle Duties .....	26,802	25,357	1,445	—	24,518	21,595
Crown Lands .....	1,290	210	80	—	1,070	1,010
Interest on Sundry Loans .....	32,639	33,111	4,528	—	23,932	22,854
Miscellaneous— Ordinary receipts .....	10,433	13,143	—	2,710	30,893	28,214
Special receipts .....	23,932	43,402	—	17,470	30,488	30,840
Totals .....	814,970	836,435	10,405	31,870	842,824	805,701
			NET DEC. £21,465			

## Values (c.i.f.) of Imports\* into the United Kingdom for the years 1928-29-30.

(From the Monthly Trade Returns, December, 1930.)

	Year ended December 31,			Increase (+) or Decrease (-) in 1930 as compared with 1929.	Increase (+) or Decrease (-) in 1930 as compared with 1928.
	1928.	1929.	1930.		
<b>I. FOOD, DRINK AND TOBACCO—</b>					
A. Grain and flour .....	£ 97,646,183	£ 95,914,625	£ 72,928,436	-22,986,189	-24,717,747
B. Feeding-stuffs for animals .....	9,180,571	9,602,904	5,743,873	-3,859,031	-3,436,698
C. Meat .....	109,264,102	113,574,647	111,670,564	-1,904,083	+ 2,406,462
D. Animals, living, for food .....	16,034,355	16,376,347	1,317,811	+ 1,941,464	+ 2,283,458
†E. Other food and drink, non- durable .....	209,528,619	243,868,071	193,255,353	-20,612,718	-16,273,266
†F. Other food and drink, durable .....	71,711,882	67,639,710	57,906,750	-9,732,960	-13,805,132
G. Tobacco .....	17,542,997	18,498,331	13,728,974	-2,769,357	-1,814,023
Total, Class I .....	330,908,709	335,474,335	475,551,761	-39,923,074	-55,356,948
<b>II. RAW MATERIALS AND ARTICLES MAINLY UNMANUFACTURED—</b>					
A. Coal .....	39,496	32,890	29,120	- 3,770	- 10,376
B. Other non-metallic mining and quarry products and the like .....	5,611,311	5,967,073	3,275,488	- 691,985	- 336,426
C. Iron ore and scrap .....	4,829,009	6,438,283	5,162,104	- 1,276,179	+ 353,095
D. Non-ferrous metalliferous ores and scrap .....	16,524,523	17,007,160	12,340,497	- 4,766,663	- 4,284,026
E. Wood and timber .....	42,537,904	45,840,135	42,797,519	- 3,042,616	+ 239,615
F. Raw cotton and cotton waste .....	80,786,992	77,365,789	14,920,399	-32,445,390	-35,866,598
G. Wool, raw, and waste, and woollen rugs .....	63,854,672	63,012,117	45,357,837	-17,754,280	-18,596,735
H. Silk, raw, knots and noils .....	1,899,963	1,901,003	1,520,313	- 380,690	- 379,650
I. Other textile materials .....	13,982,104	15,224,506	9,588,284	- 5,636,222	- 4,393,820
J. Oil seeds, nuts, oils, fats, resins and gums .....	44,603,942	43,928,333	33,873,933	-10,054,400	-10,730,009
K. Hides and skins, undressed .....	28,051,740	20,416,937	16,110,142	- 4,306,795	- 9,941,598
L. Paper-making materials .....	14,156,304	13,149,817	12,073,951	- 1,075,866	+ 1,917,617
M. Rubber .....	11,824,100	17,286,034	10,728,153	- 6,557,871	- 1,095,986
N. Miscellaneous raw materials and articles mainly un- manufactured .....	11,955,780	12,007,105	11,230,754	- 776,351	- 725,036
Total, Class II .....	334,678,022	339,576,992	250,808,124	-88,768,868	-83,869,898
<b>III. ARTICLES WHOLLY OR MAINLY MANUFACTURED—</b>					
A. Coke and manufactured fuel .....	9,604	17,660	14,000	- 7,660	+ 396
B. Pottery, glass, abrasives, &c. ....	10,897,191	11,297,353	10,907,446	- 389,907	+ 10,252
C. Iron and steel and manu- factures thereof .....	24,147,792	24,690,225	23,327,122	- 1,363,103	- 820,670
D. Non-ferrous metals and manufactures thereof .....	32,934,198	37,016,136	29,382,210	- 7,633,946	- 3,571,988
E. Cutlery, hardware, imple- ments, and instruments .....	7,633,133	8,266,336	7,697,465	- 568,871	+ 64,332
F. Electrical goods and apparatus .....	4,710,637	6,510,079	7,031,057	- 521,878	+ 2,321,220
G. Machinery .....	16,738,244	19,153,160	17,813,104	- 1,340,056	+ 1,174,860
H. Manufactures of wood and timber .....	8,423,685	9,683,514	8,741,421	- 942,093	+ 317,736
I. Cotton yarns and manu- factures .....	10,733,389	10,938,907	9,734,773	- 1,204,134	- 995,616
J. Woollen and worsted yarns and manufactures .....	17,279,336	16,225,139	14,268,590	- 1,961,549	- 3,015,746
K. Silk and silk manufactures .....	14,467,414	13,173,595	11,221,090	- 1,952,505	- 3,246,324
L. Manufactures of other textile materials .....	15,608,412	17,121,089	15,330,552	- 1,790,537	- 277,860
M. Apparel .....	19,601,645	19,955,678	19,305,234	- 650,444	- 296,411
N. Chemicals, drugs, dyes and colours .....	15,579,957	16,882,022	13,568,135	- 3,313,887	- 1,811,822
O. Oils, fats and resins, manu- factured .....	37,851,972	42,428,462	46,291,819	- 2,863,357	- 8,129,847

\* The value of the Imports represents the cost, insurance and freight; or, when goods are consigned for sale, the latest sale value of such goods.

† Duty on Tea repealed as from 22nd April, 1929, inclusive. Figures transferred from Group F to Group E.

## Values (c.i.f.) of Imports for the years 1928-29-30—Contd.

(From the Monthly Trade Returns, December, 1930.)

	Year ended December 31,			Increase (+) or Decrease (—) in 1930 as compared with 1929.	Increase (+) or Decrease (—) in 1930 as compared with 1928.
	1928.	1929.	1930.		
III. ARTICLES WHOLLY OR MAINLY MANUFACTURED—Contd.	£	£	£	£	£
P. Leather and manufactures thereof .....	19,496,276	15,821,576	15,247,141	— 574,395	— 4,249,095
Q. Paper and cardboard .....	17,271,394	17,972,297	17,989,281	+ 16,984	+ 717,887
R. Vehicles (including locomotives, ships and aircraft) .....	9,554,589	10,758,809	6,821,870	— 3,937,439	— 2,733,219
S. Rubber manufactures .....	3,345,684	3,757,076	3,927,163	+ 170,087	+ 581,479
T. Miscellaneous articles, wholly or mainly manufactured .....	31,711,500	31,682,431	28,798,112	— 2,894,319	— 2,913,388
Total, Class III .....	317,816,055	334,361,564	307,499,025	— 26,862,539	— 10,317,030
IV. ANIMALS, NOT FOR FOOD .....	3,069,023	3,527,123	3,878,723	+ 151,598	+ 609,698
V. PARCEL POST, NON-DUTYABLE ARTICLES .....	9,126,602	7,824,784	7,802,561	— 322,223	— 1,824,041
Total .....	1,195,595,413	1,220,765,300	1,044,810,194	— 175,925,106	— 150,758,319

## Values (f.o.b.) of Exports\* of British and Irish Produce and Manufactures for the years 1928-29-30.

(From the Monthly Trade Returns, December, 1930.)

	Year ended December 31,			Increase (+) or Decrease (—) in 1930 as compared with 1929.	Increase (+) or Decrease (—) in 1930 as compared with 1928.
	1928.	1929.	1930.		
I. FOOD, DRINK AND TOBACCO—	£	£	£	£	£
A. Grain and flour .....	5,334,910	4,829,389	4,256,047	— 573,342	— 1,078,863
B. Feeding-stuffs for animals .....	3,333,116	3,075,067	2,171,957	— 906,130	— 1,161,159
C. Meat .....	1,630,008	1,724,188	1,487,813	— 236,375	— 142,195
D. Animals, living, for food .....	172,728	206,142	221,633	+ 15,491	+ 48,905
E. and F. Other food and drink .....	34,262,246	36,261,936	31,632,173	— 4,629,763	— 2,791,073
G. Tobacco .....	9,363,537	9,556,327	8,482,678	— 1,073,654	— 880,864
Total, Class I .....	54,257,545	55,656,069	48,252,296	— 7,403,773	— 6,005,249
II. RAW MATERIALS AND ARTICLES MAINLY UNMANUFACTURED—					
A. Coal .....	39,058,734	48,616,311	45,671,032	— 2,945,779	+ 6,612,298
B. Other non-metallic mining and quarry products and the like .....	1,898,821	1,994,666	1,618,618	— 346,048	— 250,203
C. Iron ore and scrap .....	1,103,890	1,501,619	568,200	— 933,419	— 535,690
D. Non-ferrous metalliferous ores and scrap .....	1,777,608	1,691,320	789,117	— 902,403	— 988,491
E. Wood and timber .....	445,980	372,019	291,015	— 91,004	— 164,965
F. Raw cotton and cotton waste .....	1,832,618	1,150,541	600,209	— 550,332	— 782,409
G. Wool, raw, and waste, and woollen rags .....	10,282,320	9,621,916	4,831,834	— 4,790,082	— 5,450,486
H. Silk, raw, knubs and noils .....	37,484	28,050	14,195	— 13,955	— 23,289
I. Other textile materials .....	540,757	419,853	267,770	— 132,083	— 272,987
J. Oil seeds, nuts, oils, fats, resins and gums .....	5,379,583	5,159,401	3,612,799	— 1,546,602	— 1,766,784
K. Hides and skins, undressed .....	3,085,035	2,638,049	1,438,042	— 1,200,007	— 1,646,993
L. Paper-making materials .....	1,429,547	1,569,265	1,048,109	— 521,156	— 381,438
M. Rubber .....	255,613	276,997	174,800	— 102,397	— 81,013
N. Miscellaneous raw materials and articles mainly un- manufactured .....	3,468,018	3,859,931	2,869,484	— 990,447	— 598,534
Total, Class II .....	70,146,008	78,900,633	63,815,024	— 15,085,614	— 6,330,984

\* The value of the Exports represents the cost and the charges of delivering the goods on board the ship, and is known as the "free on board" value.



## Values (f.o.b.) of Exports for the years 1928-29-30—Contd.

(From the Monthly Trade Returns, December, 1930.)

	Year ended December 31,			Increase (+) or Decrease (-) in 1930 as compared with 1929.	Increase (+) or Decrease (-) in 1930 as compared with 1928.
	1928.	1929.	1930.		
III. ARTICLES WHOLLY OR MAINLY MANUFACTURED—	£	£	£	£	£
A. Coke and manufactured fuel	3,668,328	4,232,807	3,549,106	- 683,701	- 119,222
B. Pottery, glass, abrasives, &c.....	13,076,219	14,004,563	11,900,888	- 2,103,675	- 1,175,331
C. Iron and steel and manufactures thereof .....	66,789,184	68,002,782	51,270,033	- 16,732,749	- 15,519,151
D. Non-ferrous metals and manufactures thereof .....	16,368,083	18,293,244	12,037,798	- 6,255,446	- 4,330,285
E. Cutlery, hardware, implements and instruments ...	9,137,795	9,333,144	7,336,254	- 1,996,890	- 1,801,541
F. Electrical goods and apparatus	11,629,135	13,159,465	11,929,229	- 1,230,236	+ 300,094
G. Machinery .....	53,721,626	54,350,811	46,928,361	- 7,422,460	- 6,793,165
H. Manufactures of wood and timber .....	2,502,780	3,002,244	2,215,400	- 786,875	- 287,381
I. Cotton yarns and manufactures .....	145,302,215	135,449,458	87,573,648	- 47,875,910	- 57,728,667
J. Woollen and worsted yarns and manufactures .....	56,897,302	52,883,017	36,956,234	- 13,926,813	- 19,941,068
K. Silk and silk manufactures .....	2,406,061	2,167,930	1,556,216	- 611,714	- 849,845
L. Manufactures of other textile materials .....	29,466,156	26,865,247	19,557,521	- 7,307,766	- 9,908,635
M. Apparel .....	26,182,837	25,611,557	19,738,247	- 5,853,310	- 6,424,590
N. Chemicals, drugs, dyes and colours .....	25,410,243	26,617,229	21,966,591	- 4,650,638	- 3,443,652
O. Oils, fats and resins, manufactured .....	8,901,769	8,599,178	7,472,954	- 1,126,224	- 1,428,815
P. Leather and manufactures thereof .....	9,369,946	7,904,997	5,261,865	- 2,643,132	- 4,108,081
Q. Paper and cardboard .....	9,292,900	9,809,333	8,475,454	- 1,333,899	- 817,446
R. Vehicles (including locomotives, ships and aircraft) .....	47,257,395	50,269,355	50,741,916	+ 172,561	+ 3,484,513
S. Rubber manufactures .....	3,444,968	3,404,534	2,830,588	- 573,946	- 614,380
T. Miscellaneous articles wholly or mainly manufactured .....	37,984,469	39,838,454	30,432,827	- 9,405,627	- 7,551,642
Total, Class III .....	578,869,321	573,799,489	439,751,039	- 134,048,450	- 139,118,283
IV. ANIMALS, NOT FOR FOOD .....	1,999,433	2,025,272	1,502,029	- 523,243	- 497,404
V. PARCEL POST .....	19,306,783	18,967,854	17,232,558	- 1,735,296	- 1,074,224
Total .....	723,579,069	729,349,322	570,532,946	- 158,796,376	- 153,026,143

## Values (f.o.b.\*) of Exports of Imported Merchandise for the years 1928-29-30.

(From the Monthly Trade Returns, December, 1930.)

	Year ended December 31,			Increase (+) or Decrease (-) in 1930 as compared with 1929.	Increase (+) or Decrease (-) in 1930 as compared with 1928.
	1928.	1929.	1930.		
I. FOOD, DRINK AND TOBACCO—	£	£	£	£	£
A. Grain and flour .....	1,466,337	1,821,321	1,728,570	- 92,751	- 139,767
B. Feeding-stuffs for animals ..	518,505	247,051	189,881	- 57,170	- 128,924
C. Meat .....	3,364,137	3,581,000	3,202,957	- 378,133	- 161,170
D. Animals living, for food .....	612	2,523	2,609	+ 86	+ 1,997
†E. Other food and drink, non-dutiable .....	16,052,731	15,201,581	13,658,974	- 1,512,607	- 2,363,747
†F. Other food and drink, dutiable	3,050,708	4,401,520	4,055,528	- 345,992	- 975,180
G. Tobacco .....	904,479	737,481	959,230	+ 181,749	+ 34,751
Total, Class I .....	27,339,749	26,012,567	23,807,749	- 2,204,818	- 3,732,040

\* The value of the Exports represents the cost and the charges of delivering the goods on board the ship, and is known as the "free on board" value.

† Duty on Tea repealed as from April 22, 1929, inclusive. Figures transferred from Group F to Group E.

*Values (f.o.b.) of Exports of Imported Merchandise for the years  
1928-29-30—Contd.*

(From the Monthly Trade Returns, December, 1931.)

	Year ended December 31			Increase (+) or Decrease (-) in 1930 as compared with 1929.	Increase (+) or Decrease (-) in 1931 as compared with 1928.
	1928.	1929.	1930.		
	£	£	£	£	£
II. RAW MATERIALS AND ARTICLES MAINLY UNMANUFACTURED—					
A. Coal .....	—	—	—	—	—
B. Other non-metallic mining and quarry products and the like .....	508,662	490,888	371,067	- 119,821	- 137,803
C. Iron ore and scrap .....	9,202	3,969	5,117	+ 1,148	- 4,085
D. Non-ferrous metaliferous ores and scrap .....	181,900	399,583	214,112	- 185,471	+ 32,206
E. Wood and timber .....	735,841	717,604	461,959	- 255,645	- 273,882
F. Raw cotton and cotton waste	4,362,534	4,567,724	3,381,509	- 1,186,215	- 881,023
G. Wool, raw and waste, and woollen rags .....	27,199,364	24,910,312	16,893,338	- 8,016,474	- 10,305,526
H. Silk, raw, knubs and noils ..	33,907	13,849	16,729	+ 2,880	- 17,178
I. Other textile materials .....	1,093,171	1,049,850	783,243	- 264,567	- 307,888
J. Oil seeds, nuts, oils, fats, resins and gums .....	2,560,538	2,118,945	1,438,569	- 660,376	- 1,101,969
K. Hides and skins, undressed ..	15,367,998	12,773,139	9,875,752	- 2,897,387	- 5,392,246
L. Paper-making materials .....	31,097	51,098	26,819	- 24,279	- 4,278
M. Rubber .....	12,718,537	5,431,432	3,599,568	- 1,831,864	- 9,118,969
N. Miscellaneous raw materials and articles mainly un- manufactured .....	1,840,944	1,764,339	1,285,346	- 478,993	- 555,598
Total, Class II .....	66,443,701	54,292,732	38,375,668	- 15,917,064	- 28,068,033
III. ARTICLES WHOLLY OR MAINLY MANUFACTURED—					
A. Coke and manufactured fuel ...	44	119	81	- 38	+ 37
B. Pottery, glass, abrasives, &c. ...	172,598	186,090	161,373	- 24,716	- 11,223
C. Iron and steel and manu- factures thereof .....	186,982	220,450	268,192	+ 47,742	+ 81,210
D. Non-ferrous metals and manufactures thereof .....	3,352,514	4,431,106	2,847,840	- 1,553,266	- 404,674
E. Cutlery, hardware, imple- ments and instruments .....	1,302,101	1,374,198	1,311,249	- 62,949	+ 109,118
F. Electrical goods and apparatus	167,267	219,622	500,133	+ 280,511	+ 332,866
G. Machinery .....	1,635,828	1,630,368	1,558,947	- 73,421	- 78,881
H. Manufactures of wood and timber .....	541,132	649,047	619,623	- 29,424	+ 78,491
I. Cotton yarns and manu- factures .....	838,222	803,710	543,780	- 262,930	- 292,442
J. Woollen and worsted yarns and manufactures .....	2,526,707	2,282,325	1,565,459	- 717,366	- 961,248
K. Silk and silk manufactures ..	1,425,693	1,391,186	1,100,044	- 291,142	- 323,649
L. Manufactures of other textile materials .....	2,014,724	3,325,662	2,209,470	- 116,192	+ 194,746
M. Apparel .....	1,377,819	1,283,449	1,377,294	- 6,155	- 100,535
N. Chemicals, drugs, dyes, and colours .....	1,020,695	957,577	943,123	- 14,454	- 77,572
O. Oils, fats and resins, manu- factured .....	2,080,132	3,968,072	2,828,549	- 1,139,523	+ 748,417
P. Leather and manufactures thereof .....	2,276,509	2,232,962	1,906,882	- 326,080	- 369,627
Q. Paper and cardboard .....	298,224	268,853	270,949	- 2,096	- 27,275
R. Vehicles (including loco- motives, ships and aircraft) ..	841,608	683,454	640,221	- 43,233	- 201,387
S. Rubber manufactures .....	152,725	138,450	118,024	- 20,426	- 34,701
T. Miscellaneous articles wholly or mainly manufactured .....	4,007,696	3,875,095	3,490,535	- 384,560	- 517,161
Total, Class III .....	26,019,220	28,897,295	24,161,770	- 4,735,525	- 1,857,450
IV. ANIMALS, NOT FOR FOOD .....	280,534	499,234	635,092	+ 135,858	+ 354,558
Total .....	120,383,344	109,701,828	86,980,279	- 22,721,549	- 33,302,965

## BANK OF ENGLAND

Pursuant to the Act 7th and 8th Victoria, cap. 32 (1844  
(000's omitted.)

1	2	3	4	5	6	7	8
ISSUE DEPARTMENT.						COLLATERAL COLUMNS.	
Liabilities.	DATES.	Assets.				Notes in Hands of Public (col. 1 less Notes in Reserve, col. 17).	Minimum Discount Rate.
Notes Issued.	(Wednesdays.)	Govt. Debt (£11,013) and Govt. Securities.	Other Securities.	Gold Coin and Bullion.	Silver Coin.		
£	1830.	£	£	£	£	£	Per cent.
405,860	Jan. 1.....	244,832	10,695	145,860	4,473	369,783	5
408,061	" 8.....	245,098	10,432	149,061	4,470	362,922	
410,466	" 15.....	245,103	10,430	150,466	4,467	357,943	
411,058	" 22.....	244,666	10,856	151,058	4,478	346,400	
410,135	" 29.....	244,710	10,806	150,135	4,484	346,018	
410,784	Feb. 5.....	244,616	10,925	150,784	4,459	348,690	
410,937	" 12.....	244,614	10,925	150,937	4,461	348,003	4½
410,972	" 19.....	244,615	10,925	150,972	4,460	345,581	
411,327	" 26.....	244,613	10,925	151,327	4,462	346,812	
411,602	Mar. 5.....	244,589	10,944	151,602	4,467	347,296	
411,874	" 12.....	244,594	10,944	151,874	4,463	350,448	4
413,456	" 19.....	244,585	10,651	153,458	4,464	348,890	
415,144	" 26.....	244,602	11,538	155,144	4,460	352,304	3½
416,150	Apr. 2.....	244,006	11,538	156,189	4,456	357,265	
419,599	" 9.....	244,003	11,538	159,829	4,460	359,250	
419,823	" 16.....	243,913	11,629	159,823	4,458	361,322	
422,587	" 23.....	243,913	11,629	162,867	4,458	362,184	
423,342	" 30.....	243,913	11,629	163,342	4,459	358,822	
423,573	May 7.....	243,909	11,629	163,373	4,462	358,491	3
423,384	" 14.....	243,909	11,629	162,384	4,463	356,455	
417,498	" 21.....	243,910	11,629	157,498	4,461	354,694	
417,186	" 28.....	243,910	11,629	157,186	4,461	356,132	
415,989	June 4.....	243,807	11,629	155,989	4,464	359,799	
416,362	" 11.....	243,807	11,629	156,362	4,464	364,002	
416,610	" 18.....	243,905	11,629	156,610	4,466	359,247	
416,882	" 25.....	243,909	11,629	156,882	4,462	358,532	
416,321	July 2.....	243,907	11,629	156,321	4,464	363,583	
416,708	" 9.....	243,907	11,629	155,708	4,464	363,804	
415,479	" 16.....	243,906	11,629	155,479	4,465	365,122	
414,119	" 23.....	243,904	11,629	154,119	4,467	364,138	
413,279	" 30.....	243,901	11,629	152,279	4,470	368,377	
412,584	Aug. 6.....	243,906	11,629	152,584	4,465	372,978	
413,092	" 13.....	243,786	11,754	153,092	4,460	367,379	
414,334	" 20.....	243,906	11,629	154,334	4,465	361,791	
414,840	" 27.....	243,907	11,629	154,840	4,464	360,688	
414,480	Sept. 3.....	243,910	11,629	154,480	4,461	362,983	
413,546	" 10.....	243,910	11,629	155,546	4,461	361,326	
416,420	" 17.....	243,904	11,629	156,420	4,467	357,768	
416,305	" 24.....	243,906	11,629	156,305	4,465	355,769	
415,619	Oct. 1.....	243,910	11,627	155,619	4,463	359,386	
417,177	" 8.....	243,913	11,628	157,177	4,459	359,590	
417,824	" 15.....	243,912	11,627	157,824	4,461	357,061	
418,942	" 22.....	243,908	11,627	158,942	4,465	354,528	
419,504	" 29.....	243,908	11,627	159,504	4,465	355,626	
420,373	Nov. 5.....	243,907	11,627	160,373	4,466	356,464	
415,920	" 12.....	244,060	11,477	158,920	4,463	355,381	
417,013	" 19.....	244,061	11,476	157,911	4,462	353,740	
416,569	" 26.....	244,056	11,477	156,568	4,466	351,125	
414,649	Dec. 3.....	244,055	11,477	154,649	4,465	359,219	
411,598	" 10.....	244,058	11,477	151,598	4,465	364,474	
410,551	" 17.....	244,058	11,476	150,551	4,463	372,141	
406,201	" 24.....	244,052	11,477	148,201	4,469	379,677	
407,828	" 31.....	244,154	11,477	147,828	4,369	368,802	

## WEEKLY RETURN.

for Wednesday in each Week, during the Year 1930.

(000's omitted.)

9	10	11	12	13	14	15	16	17	18
BANKING DEPARTMENT.									
Liabilities.				DATES. (Wednes- days.)	Assets.				Totals of Liabilities and Assets.
Capital (£14,533) and Res.	Public Deposits.	Banker's Deposits.	Other Ac- counts.		Govt. Secur- ities.	Dis- counts and Ad- vances.	Other Secur- ities.	Reserve (Notes and Coin).	
£	£	£	£	1929.	£	£	£	£	£
18,004	12,350	110,297	37,523	Jan. 1 .....	81,659	42,171	18,013	36,233	178,176
18,057	17,210	73,701	35,574	" 5 .....	89,885	15,082	15,285	46,293	146,545
18,077	24,811	61,358	36,419	" 15 .....	61,251	9,672	14,034	58,711	143,668
18,099	29,751	59,948	36,012	" 22 .....	57,666	5,779	14,879	64,589	143,213
18,141	14,593	67,463	35,987	" 29 .....	54,301	5,500	13,976	62,410	136,187
18,160	23,294	54,350	36,227	Feb. 5 .....	49,895	5,603	13,915	62,521	137,934
18,179	17,937	59,084	35,482	" 12 .....	44,712	7,963	14,513	63,496	130,684
18,207	13,871	59,167	34,417	" 19 .....	38,581	4,733	16,293	66,058	125,605
18,259	11,987	50,714	36,231	" 26 .....	34,442	4,716	12,869	65,167	117,194
18,277	7,675	63,694	33,922	Mar. 5 .....	38,631	6,841	15,104	64,904	125,570
18,304	8,987	59,001	36,743	" 12 .....	37,332	7,960	15,570	62,175	123,037
18,301	12,883	62,098	33,833	" 19 .....	41,482	6,060	16,258	65,355	129,155
18,391	18,787	54,874	35,917	" 26 .....	44,767	6,110	13,301	63,693	127,871
18,281	18,423	62,834	37,358	Apr. 2 .....	54,022	10,310	12,706	59,860	136,898
17,666	15,168	63,251	36,658	" 9 .....	55,802	6,288	11,064	61,531	134,745
17,669	14,798	65,816	36,303	" 16 .....	58,283	6,386	10,443	59,466	134,578
17,674	17,314	66,011	35,779	" 23 .....	58,053	6,804	10,274	61,659	136,790
17,716	21,003	66,162	35,561	" 30 .....	59,238	6,755	9,999	65,462	141,454
17,746	16,211	69,534	36,031	May 7 .....	56,363	6,555	9,609	66,011	138,538
17,736	24,548	58,311	36,457	" 14 .....	52,793	6,403	10,989	66,593	137,078
17,770	21,778	57,836	37,235	" 21 .....	49,788	6,537	13,643	63,749	134,017
17,753	13,241	58,864	35,907	" 28 .....	43,578	6,805	11,516	61,985	125,884
17,753	8,878	71,082	36,909	June 4 .....	58,381	6,476	12,717	37,080	134,654
17,855	8,239	58,829	35,383	" 11 .....	46,311	6,804	13,943	53,178	120,236
17,855	16,578	58,331	35,657	" 18 .....	46,475	7,099	16,641	58,242	128,457
17,938	21,505	63,776	36,114	" 25 .....	48,858	15,899	15,340	59,241	139,336
18,004	11,671	64,305	36,063	July 2 .....	49,075	29,917	19,408	53,645	152,045
18,048	9,264	69,533	36,237	" 9 .....	54,125	6,266	19,911	52,782	133,084
18,063	10,397	69,588	35,506	" 16 .....	55,695	6,218	20,392	51,251	133,556
18,073	9,904	67,966	36,207	" 23 .....	51,356	7,098	22,102	50,896	137,452
18,106	9,088	60,971	37,405	" 30 .....	51,660	6,741	22,292	44,573	125,572
18,129	8,866	61,552	36,787	Aug. 6 .....	53,146	7,960	23,614	40,617	125,337
18,131	12,256	66,253	34,020	" 13 .....	54,346	6,885	22,744	46,796	130,681
18,156	21,045	61,665	33,594	" 20 .....	49,371	6,114	25,434	53,575	134,494
18,234	18,773	62,000	33,799	" 27 .....	49,141	6,460	22,187	55,020	132,668
18,244	7,917	67,428	34,617	Sept. 3 .....	47,881	6,230	21,559	52,539	128,209
18,151	9,014	67,186	34,137	" 10 .....	45,911	5,770	18,641	53,248	128,570
18,265	8,933	68,308	33,786	" 17 .....	38,768	5,377	22,409	59,743	126,495
18,292	13,310	64,174	34,195	" 24 .....	41,057	5,672	21,586	61,658	129,973
18,273	21,645	61,131	34,789	Oct. 1 .....	44,536	11,917	22,158	57,416	136,027
17,638	12,861	66,447	34,251	" 8 .....	44,686	4,880	23,530	59,123	131,199
17,632	12,397	66,184	36,087	" 15 .....	42,301	6,123	22,882	61,961	132,727
17,643	27,933	53,605	34,099	" 22 .....	41,636	4,979	22,969	65,598	135,182
17,655	20,970	55,694	35,002	" 29 .....	37,668	4,249	22,367	65,041	129,323
17,689	19,377	55,633	34,315	Nov. 5 .....	35,091	4,459	22,487	65,079	127,115
17,711	16,979	60,321	33,150	" 12 .....	36,726	4,288	22,449	64,700	128,163
17,777	17,780	59,461	32,953	" 19 .....	33,431	4,898	24,864	65,225	127,919
17,723	18,869	56,901	36,813	" 26 .....	34,596	6,081	22,236	66,448	129,361
17,844	7,843	81,858	34,227	Dec. 3 .....	58,966	4,606	21,791	56,412	141,775
17,880	5,891	72,112	33,483	" 10 .....	54,291	4,911	22,191	47,975	129,369
17,886	6,524	84,296	33,479	" 17 .....	53,886	5,341	23,783	39,175	122,186
17,902	10,825	86,317	33,688	" 24 .....	61,736	14,199	23,014	29,145	118,094
17,953	6,581	132,447	36,139	" 31 .....	81,021	48,963	23,690	39,470	193,144

FOREIGN EXCHANGES.—*Quotations as under, LONDON on Paris, Berlin and Calcutta; New York and Hong Kong on LONDON, 1930.*

DATE Wednesdays.)	1	2	3	4	5	6		7
	London on Paris.	London on Berlin.	London on Calcutta.	New York on London.	Hong Kong on London.	Price per Ounce.		
	Cables (middle rate).	Cables (middle rate).	Demand (middle rate).	Cables (closing rate).	T.T.	Gold Bars (fine).	Silver Standard Bars (cash).	
1930.	<i>l. s.</i>	<i>Reich- marks.</i>	<i>s. d.</i>	<i>£ s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	
Jan. 1 ....	123-87½	20-41½	1-5½	4-88 (2nd)	1-8½ (2nd)	84-11½	1-9½	
" 15 ..	123-92½	20-38	1-5½	4-87	1-8½	84-11½	1-9½	
" 29 ..	123-89½	20-36½	1-5½	4-87	1-7½	84-11½	1-8½	
Feb. 12 ....	124-14½	20-37½	1-5½	4-86 (11th)	1-6½	84-11½	1-8½	
" 26 .....	124-26½	20-36½	1-5½	4-86	1-6½	84-11½	1-7½	
Mar. 12 ...	124-24½	20-38½	1-5½	4-86	1-6½	84-11½	1-7½	
" 26... ..	124-27½	20-38½	1-5½	8-86 (27th)	1-6½	84-11	1-7½	
Apr. 9.....	124-20½	20-37½	1-5½	4-86	1-6½	84-11½	1-7½	
" 23... ..	123-94	20-37½	1-5½	4-86 (21th)	1-6½	84-11½	1-7½	
May 7 ...	123-86½	20-36½	1-5½	4-86	1-6½	84-11½	1-7½	
" 21 ...	123-97½	20-36½	1-5½	4-86	1-5½	84-11½	1-6½	
June 4 .....	123-91½	20-35½	1-5½	4-86	1-3	84-11½	1-3½	
" 18 .....	123-80	20-36½	1-5½	4-86	1-3½	85	1-3½	
July 2 ....	123-63½	20-38½	1-5½	4-86 (3rd)	1-3½	85 0½	1-3½	
" 16 ....	123-61½	20-37½	1-5½	4-87	1-3½	85-1½	1-3½	
" 30 .....	123-76½	20-37½	1-5½	4-87	1-3½	85-0½	1-4	
Aug. 13 ....	123-82½	20-38½	1-5½	4-87	1-3½	85-0½	1-4½	
" 27... ..	123-77½	20-39	1-5½	4-87	1-4	85-0½	1-4½	
Sept. 10 ....	123-82½	20-41½	1-5½	4-86	1-4	84-11½	1-4½	
" 24 ...	123-76	20-40½	1-5½	4-86	1-4½	85-0½	1-4½	
Oct. 8 ....	123-84½	20-42½	1-5½	4-86	1-3½	84-11½	1-4½	
" 22... ..	123-84½	20-41½	1-5½	4-86	1-3½	85-0½	1-4½	
Nov. 5 .....	123-694	20-38½	1-5½	4-86	1-3½	85 0½	1-4½	
" 19.....	123-65½	20-37½	1-5½	4-86	1-3½	85-1	1-4½	
Dec. 3.....	123-574	20-36½	1-5½	4-86	1-2½	85-1½	1-4½	
" 17.....	123-61½	20-37½	1-5½	4-86	1-1½	85-1½	1-2½	

JOURNAL  
OF THE ROYAL STATISTICAL SOCIETY  
PART II, 1931.

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A STATISTICAL ANALYSIS OF BUILDING SOCIETIES.

By JAMES BRACE, B.Sc., LL.B.

[Read before the Royal Statistical Society, January 20, 1931.

Sir J. C. STAMP, G.B.E., LL.D., President, in the Chair.]

*Introduction.*

IN view of the prominent position which building societies have now attained in the world of finance, no apology is necessary for reviewing the statistics relating to such institutions, more especially as it would appear that no previous attempt has been made to analyse the figures pertaining to the whole of the movement and to place observations thereon before Fellows of the Royal Statistical Society for their consideration and discussion.

Before proceeding further, however, it would be advisable to make a few remarks relating to the status of building societies.

The objects of building societies should be, and in the case of all incorporated societies are, restricted to the raising of funds by the subscriptions of members and by loans received from depositors or other persons for the purpose of advancing those funds to members and, in exceptional cases, to other persons upon the security of freehold or leasehold property. All surplus funds, however, may be invested in trustee securities at the discretion of the directorates.

Building societies may be either incorporated or unincorporated societies, the former being by far the larger group. The number of unincorporated societies in Great Britain as at 31st January, 1930, was only 31, whereas the number of those incorporated was 981. The latter are those societies which have become incorporated according to the provisions of the Building Societies Act, 1874, while the former are those societies which were established

before 1857 and which function through trustees according to the provisions of the Building Societies Act, 1836. All building societies established since the Building Societies Act, 1874, came into force have been required to register under the Act and thereby to become incorporated bodies.

Building societies may also be either permanent or terminating societies. The former is the more popular form, 820 of such societies being recorded as operating in Great Britain as at 31st January, 1930, whereas only 192 of the latter form were in existence at that date. The terminating society, as the name implies, is a form of building society which is wound up when all its members have received the advances which are due to them in respect of their subscriptions. The permanent society is one which by its rules has not determined any fixed date or specified event at which its operations shall cease.

At the end of January, 1930, the value of the assets, which may be defined as consisting of mortgage advances, properties in possession, offices and equipment, investments in trustee securities, and cash at bank and in hand, of all building societies with headquarters situated in Great Britain was computed to be £312,745,883 as compared with £268,464,781, the valuation as at 31st January, 1929, showing an increase of 16·5 per cent. during the year. The value at the moment is probably more than £350 millions. These are remarkable figures, and it is evident that the amount of wealth now controlled by building societies will not be without effect upon financial conditions in this country in future years.

In the course of a paper which I read before the Annual Conference of Building Societies at Eastbourne last June, and which dealt with the question of amalgamation among such societies, I touched upon several aspects of the movement which, in view of their importance, it was felt desirable to analyse further and to investigate from different points of view. Accordingly, in the present paper are included results which have been obtained from an analysis of the statements of accounts relating to the year 1929 of 110 building societies, each of which has been selected at random.

Originally the statements of accounts of 111 societies were analysed, but one of them, which, by the way, was the smallest society included in the sample, having mean assets valued at only £5,220, gave such abnormal results that it was decided to exclude it in order to avoid burdening some of the tables with explanatory footnotes. For the information of Fellows, I mention the results obtained in respect of that society, which had its head office situated in London. They are as follows:

Average rate of interest charged to borrowers ...	9.7	per cent.
Average rate of earnings per £100 of mean shareholding ... ..	£5.6	„ „
Average rate of dividends paid per £100 of mean shareholding ... ..	£4.1	„ „
Proportion of reserves to other liabilities ... ..	5.5	„ „
Average cost of administration per £100 of mean assets ... ..	£3.59	„ „

As the value of the mean assets of the 110 societies during the year 1929 was £165,742,000, or 57.0 per cent. and 58.2 per cent. of the total value of the mean assets of all societies with head offices situated in Great Britain and England respectively during that year, it will be observed that the results set forth in the following tables relate to the greater part of building society activity. The values of the mean assets of the societies considered in the present analysis, classified according to one or other of seven principal English districts and indicating the proportions which such values represent of the total values of the mean assets of all societies with head offices situated in those districts, are as follows :

	£1,000.	Proportion per cent.
Northern counties, including Yorkshire ...	89,478	68
Lancashire and Cheshire ... ..	2,897	17
Midland counties ... ..	18,211	45
Eastern counties ... ..	1,479	39
Western counties ... ..	2,202	24
London and district ... ..	47,001	60
Southern counties ... ..	4,474	80
All districts (England) ... ..	165,742	58

It is regretted that the proportions relating to Lancashire and Cheshire and the western counties are not greater and that consequently the results obtained for these districts are not more representative, but, as the selection of the various statements of accounts was, as already stated, entirely unbiased, some anomalies were bound to arise.

In the enquiry which I undertook last June the statement of accounts of 47 societies only were investigated. The present enquiry, therefore, covers a larger field, and consequently the results may be considered to be fairly representative, especially in view of the fact that general results do not differ materially from those which were obtained as a result of my preliminary enquiry.

#### *Development.*

Building societies as an institution are not of recent origin. It has been ascertained that one was established as long ago as 1781,



but unfortunately prior to 1890 any statistics which may have been published are considered to be of doubtful validity, and consequently any serious attempt to analyse statistically the growth of the movement must necessarily commence with those of that year.

The figures contained in Table I illustrate the progress which has been made since 1890.

The most interesting point to observe in relation to the figures indicating membership is that, with the exception of the decrease which lasted until 1901, and the gradual recovery until the failure of the Birkbeck Building Society in 1911, no extraordinary movement in the records occurs until 1919. It is true that prior to the European War of 1914–1918 there were variations, but there certainly was no indication of what was to be the trend under post-war conditions. In fact, having regard to the increase in population of Great Britain between 1890 and 1914 it is surprising to find that the ratio of membership of building societies compared with population had actually fallen during that period.

Another interesting feature is that the figure of membership for the year 1890 (though it includes membership in Ireland, this must have been relatively inconsiderable) was the highest recorded until the post-war year of 1919 is reached, although in 1895 figures relating to membership of unincorporated societies were included for the first time.

Fellows will observe that the number of building societies on the Register has shown a progressive decline since 1895. This is due to the fact that each year a certain number of societies of what is known as the terminating class are wound up on the completion of business, while a certain number of those of the class known as permanent also wind up or amalgamate for various reasons. The tendency at the moment is for building societies to become smaller in number, but larger from the point of view of the value of assets.

Commencing with the close of the European War in 1918 interest in building societies began to increase and membership rapidly developed. At the end of 1926, or during a period of eight years, it had approximately doubled, while three years later—namely, at the end of 1929—figures of membership had trebled. There are several reasons for such remarkable progress, but the basic one is undoubtedly the post-war scarcity of housing accommodation, rendered more acute, as any economist will testify, by the monopoly conferred upon the favoured few by the provisions of the Rent Restriction Acts. The demand for loans by would-be purchasers of houses naturally caused building societies to offer better inducements to investors, thus attracting quite considerable amounts from other sources of safety-first investments where the rates offered to

TABLE I.

*Table illustrating Progress in Membership of Building Societies, with Head Offices Situated in Great Britain, since 1890.*

Year.					No. of Societies on Register at end of Year.	No. of Members.
(a)	1890	...	...	...	2,860	659,028
(a)	1891	...	...	...	2,767	654,143
(a)	1893	...	...	...	2,885	(b) 601,482
(a)	1894	...	...	...	2,792	599,177
	1895	...	...	...	3,642	(c) 631,355
	1896	...	...	...	2,983	622,628
	1897	...	...	...	2,616	605,998
	1898	...	...	...	2,494	599,552
	1899	...	...	...	2,378	589,538
	1900	...	...	...	2,286	584,651
	1901	...	...	...	2,208	577,542
	1902	...	...	...	2,145	581,328
	1903	...	...	...	2,073	588,616
	1904	...	...	...	2,018	597,650
	1905	...	...	...	1,950	602,060
	1906	...	...	...	1,916	607,768
	1907	...	...	...	1,863	614,753
	1908	...	...	...	1,829	616,470
	1909	...	...	...	1,777	624,446
	1910	...	...	...	1,723	626,366
	1911	...	...	...	1,644	(d) 602,684
	1912	...	...	...	1,609	607,721
	1913	...	...	...	1,550	617,423
	1914	...	...	...	1,506	627,240
	1915	...	...	...	1,451	626,174
	1916	...	...	...	1,402	620,335
	1917	...	...	...	1,366	612,753
	1918	...	...	...	1,336	625,013
	1919	...	...	...	1,311	672,369
	1920	...	...	...	1,271	747,589
	1921	...	...	...	1,226	789,052
	1922	...	...	...	1,184	826,032
	1923	...	...	...	1,151	895,524
	1924	...	...	...	1,112	1,000,988
	1925	...	...	...	1,092	1,129,455
	1926	...	...	...	1,064	1,257,400
	1927	...	...	...	1,054	1,416,456
(e)	1928	...	...	...	1,035	(f) 1,683,950
(e)	1929	...	...	...	1,012	(g) 1,894,262

(a) Including figures for Ireland. Figures for 1892 are not available.

(b) Decrease due to failure of Liberator Building Society in 1892.

(c) Increase due to inclusion for first time of 995 unincorporated societies with 75,444 members.

(d) Decrease due to failure of Birkbeck Building Society in that year.

(e) End of year changed from 31st December to 31st January of year following.

(f) Comprises 1,130,066 investors and 553,884 borrowers, such distinction not being made in earlier years. An investor may also be a borrower.

(g) Comprises 1,265,329 investors and 628,933 borrowers.

investors were less. With increased receipts it became essential to ensure that mortgage business should also progress, in order that no surplus funds should be retained in hand. Increased advertising paved the way, and now building societies are receiving money at the rate of approximately £170 millions per annum, and the majority of investors are entitled to receive interest on their invested moneys at the rate of 5 per cent. per annum and free of income tax as far as they are concerned.

A review of the values of mortgage assets (see Table II) shows that such were steadily increasing from 1896 until 1914, indicating that, although membership was fairly stationary during that period, individual investments must have gradually increased per head.

### *Mortgage Business.*

Any building society incorporated under the Building Societies Acts is established "for the purpose of raising by the subscriptions of the members a stock or fund for making advances to members out of the funds of the society upon the security of freehold, copyhold, or leasehold estate, by way of mortgage" (Section 13, Building Societies Act, 1874). Thus investment of receipts upon mortgage account is the prime function of a building society.

The amount of the advance made in each case depends to a considerable extent upon the status of the borrower and the type of security offered, but the usual proportion advanced upon each type of security is 75 per cent. of the valuation or of the purchase price of the property, whichever be the lower figure, in cases where the repayments are to extend over a period not exceeding 20 years, and 80 per cent. in cases where the period of repayment is not to exceed 15 years. Even in the latter event many well-organized societies will not permit the three-quarters limit to be exceeded.

The limits mentioned in the previous paragraph, however, are frequently exceeded with the aid of guarantees or the deposit of collateral security. By the provisions of Section 92 of the Housing Act, 1925, local authorities are permitted to guarantee excess advances in cases of owner-occupier of residential properties, provided that the total advance does not exceed 90 per cent. of the valuation adopted. Certain insurance companies also are willing to guarantee excess advances such that not more than 90 per cent. of the valuation adopted be advanced, but, as the premium chargeable in such cases is expensive to the borrower, being usually 10 per cent. of the excess advance, it is suggested that, if possible, advantage should be taken in such cases of the provisions of Section 92 of the Housing Act, 1925. Both local authorities and insurance companies confine their guarantees as a general rule to cases of

owner-occupier of residential properties valued at not more than £1,500. Another scheme, and one frequently adopted at the present time, is for a third party, usually the builder-vendor, to deposit cash with the society to cover any excess advance made to his purchaser. In such cases advances may be made to within, say, £25 of the valuation, but the margins and the actual amounts of cash deposits to be lodged with the society are matters for agreement between the societies and the third parties concerned, the cash deposits, however, usually being made on a basis of 50 per cent. cover.

It may be as well to include here an example of the variations in the amounts of an advance granted to an owner-occupier of a house valued at £1,000 and not purchased for less than that amount, dependent upon the fact whether one or other of the schemes mentioned above has been adopted. The various figures would be as follows, assuming the society to advance 75 per cent. at its own risk:

Method.	Normal Amount Advanced.	Amount Advanced with Aid of Guarantee.	Cost to Borrower for Excess Advance.	Amount to be Provided by Borrower.
	£	£	£	£
Straight advance (say 75 per cent.) ... ..	750	—	—	250
Local authority guarantee ...	750	900	—	100
Insurance company's guarantee ... ..	750	900	15	115
Cash deposit by guarantor (say £200) ... ..	750	950	—	50

The principal advantage to be derived by procuring an advance on mortgage from a building society rather than from a bank or private mortgagee is that the borrower may rest assured that, provided he duly carries out the terms of his contract, he will not be called upon by the society to redeem the mortgage. Another great advantage is that in the great majority of cases the rate of interest charged to the borrower remains constant throughout the term of the mortgage, the rate not being varied according to changes in the bank rate.

In passing, it should be mentioned that local authorities are empowered to make advances to owner-occupiers in accordance with the provisions of the Small Dwellings Acquisition Act, 1892, and that consequently such bodies compete to some extent with building societies. It is suggested, however, that, as the costs of administration in such cases are borne by ratepayers generally, many of whom are already purchasing their houses with the aid

of building societies, local authorities adopting the act should be required to administer the scheme on a self-supporting basis. If such were a condition insisted upon by the act, I feel sure that building societies would not need to fear competition from that direction.

In view of the preceding remarks, an examination of the figures relating to mortgage business transacted by building societies since 1890 is of considerable interest. The figures respecting such activity are appended herewith (Table II).

As far as records are available, the annual amount advanced on mortgage prior to 1914 was a fluctuating figure, being approximately £9 millions. With the advent of war in 1914, however, the desire for housing accommodation declined, probably the chief reason being that many of the families of those serving with the colours gave up housekeeping and moved into their parents' homes. In 1919, consequent upon the return of demobilized men and the almost complete cessation of building operations during the war, building societies had their opportunity, and they were not slow to seize it, as the figures shown in Table II indicate. The set-back in 1921 was due, of course, to the serious trade depression which commenced in the previous year.

As an illustration of the enormous advance business which building societies are now carrying on, it may be assumed that £500 represents the normal amount of an advance to be made upon a dwelling-house. Allowing for the fact that a portion of the amount advanced during 1929 was advanced upon the security of business premises and also to existing owners of properties, it may be estimated that nearly 150,000 houses were purchased during that year with the assistance of building societies. When one remembers that the total number of houses erected in England and Wales during the year ended 31st March, 1930, was 202,060, or approximately 220,000 in the whole of Great Britain during the same period, it will be realized what important influence the building society has upon the readjustment of social conditions.

The value of outstanding mortgages at the end of 1929 was £268 millions. Proceeding on the same basis as indicated in the previous paragraph, but in this case assuming that £475 is the average outstanding amount per mortgage, it would appear that more than 500,000 houses are now being purchased through the medium of building societies.

An examination of the last three columns of Table II presents a very pleasing feature, and it is to the effect that the proportion of amounts greater than £5,000 outstanding on mortgage is tending to decrease, and this in spite of the recent rapid increases in advance

TABLE II.

*Statistics Relating to Mortgage Business of Building Societies, with Head Offices Situated in Great Britain.*

Year.	Amount Advanced on Mortgage during each Year.	Balance due on Mortgage at end of Year.	Percentage of Total Mortgage Assets.		
			Mortgages of over £5,000.	Properties in Possession and Mortgages in Arrear for more than Twelve Months.	Other Mortgages
	£1,000	£1,000			
(b) 1890	(a)	48,443	(a)	(a)	(a)
(b) 1891	(a)	47,703	(a)	(a)	(a)
(b) 1893	(a)	40,547	(a)	(a)	(a)
(b) 1894	(a)	37,970	(a)	(a)	(a)
1895	(a)	(c) 43,180	3.0	7.2	89.8
1896	(a)	42,808	4.7	14.7	80.6
1897	(a)	42,869	4.7	12.4	82.9
1898	(a)	43,617	4.7	10.2	85.1
1899	(a)	44,688	4.8	8.4	86.8
1900	(a)	45,641	4.7	7.3	88.0
1901	8,908	46,831	4.3	6.5	89.2
1902	8,862	48,145	4.2	5.7	90.1
1903	9,733	50,305	4.1	5.3	90.6
1904	9,375	52,003	4.0	5.0	91.0
1905	9,011	53,211	3.8	4.9	91.3
1906	9,150	54,460	3.8	4.9	91.3
1907	9,636	56,177	3.6	4.8	91.6
1908	8,920	57,326	3.6	4.8	91.6
1909	9,011	58,257	3.5	5.0	91.5
1910	9,292	59,696	3.4	4.9	91.7
1911	8,903	59,708	3.6	5.3	91.1
1912	8,338	60,085	3.5	5.3	91.2
1913	9,131	60,733	3.4	4.7	91.9
1914	8,762	61,050	3.3	3.7	93.0
1915	6,531	59,889	3.2	3.7	93.1
1916	4,925	57,099	3.2	3.5	93.3
1917	4,485	54,477	3.1	3.4	93.5
1918	6,971	53,208	3.1	3.0	93.9
1919	15,841	57,866	3.7	2.0	94.3
1920	25,095	68,812	3.7	1.1	95.2
1921	19,673	75,503	3.7	0.8	95.5
1922	22,708	83,725	4.2	0.6	95.2
1923	32,016	98,845	5.2	0.4	94.4
1924	40,585	119,745	5.4	0.3	94.3
1925	49,822	145,857	4.8	0.2	95.0
1926	52,151	171,221	4.2	0.2	95.6
1927	55,887	197,748	3.8	0.2	96.0
(d) 1928	58,665	227,533	3.3	0.2	96.5
(d) 1929	74,719	268,141	3.4	0.2	96.4

(a) Not available.

(b) Including figures for Ireland. Figures for 1892 are not available.

(c) Increase due to inclusion for first time of 995 unincorporated societies with £5,527,000 due upon mortgage securities.

(d) End of year changed from 31st December to 31st January of year following.

business, while scheduled cases of properties in possession and mortgages in arrear for more than twelve months are becoming a very small proportion of building society assets.

The Chief Registrar of Friendly Societies, in Section 1 of his report upon building societies for the year 1929, stated that "the proportion of mortgages with a present debt of over £5,000, on the whole, shows a tendency to increase." This statement does appear to be supported by the figures in column 4 of Table II, but it must be remembered that several building societies are now making advances upon blocks of properties, and in such cases, although the actual amounts advanced may appear to be high, when averaged among the number of individual properties mortgaged, the amounts are not excessive.

#### *Returns from Mortgage Advances.*

Repayments by advanced shareholders of building societies are usually made on the annuity system, by means of which a regular monthly repayment is made, and which includes, in addition to interest charges, a gradual redemption of the outstanding loan. Thus the rates of repayment usually published by societies do not indicate the amount or rate of interest which is actually charged to borrowers. In addition, in many cases, extra charges are made, such as premiums, calculated upon the total amount of the advance to be made, and additional repayments for the privilege of being permitted to participate in bonus declarations.

In order to ascertain the average rates of interest which are actually charged to borrowers, an analysis of the statements of accounts published by 110 building societies, which have been selected at random and which relate to the year 1929, has been made and the results are appended (Table III). The rates have been based upon the mean mortgage assets for the year of each society.

Variations in rates of interest charged to advance shareholders are due to some extent to the method of calculation adopted by the various societies. For instance, the rates generally quoted in the north and south of England are  $5\frac{1}{2}$  and 6 per cent. respectively, but, unless one knows the method adopted in computing the amount of interest payable, one is at a loss to ascertain the effective rate charged. Thus, if the rate be charged upon the annual balance of principal due, the effective rate, assuming the monthly repayment system to be in force, is higher than the quoted rate, as no credit is given for the monthly reduction in the principal amount due. This is the reason why, although the rate of interest usually quoted by metropolitan and southern societies as being charged to

TABLE III.

*Average Rates of Return on Mortgage Advances received by 110 Building Societies, with Head Offices Situated in England, as Disclosed by the Published Statements of Accounts for the year 1929 and Classified according to one or other of Seven Principal Districts.*

District	No. of Societies	Simple Average Rate of Mortgage Interest Received.	Minimum and Maximum Average Rates for each District.
Northern counties, including Yorkshire ... ..	34	5.2	4.4-6.3
Lancashire and Cheshire ... ..	12	5.6	5.0-6.5
Midland counties ... ..	14	5.4	5.0-6.4
Eastern counties ... ..	5	5.3	4.9-5.7
Western counties ... ..	10	5.9	5.2-7.0
London and district ... ..	16	6.4	5.3-7.0
Southern counties ... ..	19	6.1	4.7-7.5
All districts ... ..	110	5.7	4.4-7.5

borrowers is the same—namely, 6 per cent.—the monthly amount of repayment per £100 advanced required in the case of the metropolitan societies is usually higher than that demanded by most of the southern societies, the former societies as a general rule charging the rate upon annual balances.

It will be observed by reference to Table III that the averages obtained for those districts north of an imaginary line drawn from Cheshire to the estuary of the River Thames are lower than those computed for the southern area. This is due to the fact that societies with head offices situated in the greater part of the former districts have been able to borrow the necessary funds at cheaper rates than are demanded in the south. There is, however, a tendency, largely due to the peaceful penetration by the large metropolitan societies, who are offering better terms to investors, for rates in the northern, midland and eastern counties to be increased, and probably the time is not far distant when rates generally will become more or less standardized throughout the country.

Rates charged to borrowers from societies with head offices situated in the metropolitan area are among the highest recorded, and consequently the average computed for that district is high. A practice has developed, and has become general among such societies, to pay commission for the introduction of mortgage business, and, until the metropolitan societies can agree among themselves to abolish the practice, it is difficult to see how their terms will ever be able to compare favourably with those of societies which do not have to bear such charges. Another reason, however, for the high return obtained is that the larger metropolitan



societies have a system whereby the advance shareholder is charged an additional  $\frac{1}{2}$  or 1 per cent. in respect of interest during the first four or five years of the mortgage repayment period, allowance being made therefor during the remaining period of the mortgage term in order that the quoted rate may apply. The reason given for this procedure is that redemptions of mortgages during the first four or five years of the mortgage term are uneconomic from the point of view of administrative costs. The fact remains, however, that many mortgages are redeemed within such short periods, with the result that the societies concerned have been enabled to employ a portion of their funds at a rate much higher than that quoted.

Actual average rates of interest received from borrowers have also been analysed according to the magnitude of societies, as evidenced by the mean size of total assets and the results are shown below (Table IV).

TABLE IV.

*Average Rates of Return on Mortgage Advances received by 110 Building Societies, with Head Offices Situated in England, Classified according to Mean Value of Assets as Disclosed by the Published Statements of Accounts for the year 1929.*

Value of Mean Assets.			No. of Societies.	Simple Average Interest Charge per £100 of Mean Mortgage Assets.	Minimum and Maximum Average Rates included in each Group.
				£	£ £
Up to	£50,000	...	9	5.7	5.0-6.3
£50,000	£100,000	...	19	5.9	4.7-7.1
£100,000	£150,000	...	12	5.9	5.1-7.5
£150,000	£200,000	...	11	5.8	5.0-7.0
£200,000	£300,000	...	11	5.4	4.9-6.5
£300,000	£400,000	...	10	5.5	4.9-6.3
£400,000	£600,000	...	9	5.6	5.0-6.3
£600,000	£1,000,000	...	8	5.6	5.0-6.6
£1,000,000	£2,000,000	...	8	5.5	4.4-7.4 (a)
£2,000,000	£4,000,000	...	6	5.4	5.0-6.6
£5,000,000	£10,000,000	...	4	6.0	5.1-6.6
£10,000,000	£20,000,000	...	2	6.0	5.3-6.6
£50,000,000	£60,000,000	...	1	5.8	—
All societies	..	...	110	5.7	4.4-7.5

(a) This society has a bonus participating scheme for borrowing members. Deducting the amount paid out as bonus to such members during the year, the adjusted return is 6.8. This adjusted figure, however, remains the maximum return recorded for the group. The quoted average of 5.5 for the group would be reduced to 5.4 if the adjusted figure had been included instead of the figure of actual average charge, but the quoted average for all societies would remain unaltered.

From the point of view of the borrower the most attractive society would appear to be one with assets valued at approximately either £300,000 or £2,000,000 and with head offices situated in the provinces. This may be due to the fact that societies of such size are in the position of being able to watch very carefully their costs of administration, as there is in those cases usually personal supervision on the part of those responsible for management. It is interesting to note that, in the course of the paper which I read at Eastbourne last June, I remarked that societies with assets valued at between £2 millions and £3 millions would appear to be the most economic when regarded from the point of view of magnitude.

The rates charged to borrowers by some societies are extremely high in view of the excellent security usually offered. On the contrary, it is pleasing to find that a relatively large society only charges its borrowing members on the average 4·4 per cent. per annum, and that, in addition, it can show a percentage of reserves well above the average and a percentage cost of administration lower than any other society included in the sample with the exception of one.

#### *Investment Business.*

The bulk of the resources of building societies are received from two sources—namely, from share investors, who become members of a society, and from depositors, who are merely lenders of money to a society, and who, consequently, have no voice in the management of the society unless the rules otherwise provide. Deposits or loans can only be received up to certain defined limits (see Section 15, Building Societies Act, 1874, and Section 14, Building Societies Act, 1894), while no restrictions are imposed by law upon the receipt by societies of moneys on share account.

The shares of a building society usually consist of two classes—namely, (a) subscription shares for which the shareholder undertakes to contribute a small monthly subscription until such time as the share is said to mature, and (b) fully-paid shares, which are purchased outright. The nominal value of the shares varies according to the particular society concerned, but only in a few cases is it as low as one pound sterling. The rates of dividend, frequently called interest, allowed upon the shares of each class usually differ by  $\frac{1}{2}$  per cent., the lower rate being applicable to those of the subscribing type. This is due to the fact that such shares invariably entail higher costs of management. At the present time the great majority of shares issued by building societies are of the fully paid class. Bonus, in addition to dividend, is often allowed to shareholders. It may be added in passing that the provisions of the

Building Societies Acts do not require the shares to be numbered. Many societies, however, allocate numbers to them for convenience.

Table V illustrates the progress made by building societies in Great Britain in regard to investment business.

It will be observed that investments on deposit account have not increased during post-war years at the same rate as those on share account, the reason being that investors, having considerable faith in the stability of building societies, prefer to take advantage of the higher rates of interest offered to shareholders rather than to secure an investment which offers a greater degree of safety, but at a lower rate of dividend. In fact at the present time, when, speaking generally, building societies are able to accept deposits up to two-thirds of the value of their mortgage assets, only about 26 per cent. of the facility available is utilized by investors on deposit account, and consequently at 31st January, 1930, each £1 invested on deposit account was covered by £6 13s. 7d. worth of assets. This is excellent security for an investment which in the majority of cases is offered at 4 per cent. per annum, free of income tax.

A consideration of the percentages given in the fourth column of Table V shows that until the early part of the present century there was a growing tendency for investments to be made on deposit account rather than on share account. Two reasons may account for this. Firstly, investors were more anxious to obtain security for their investments than they are at the present time, and secondly, the opportunity to become a shareholder may have become somewhat restricted, the result being that surplus investments were only received on deposit account. An illustration of the latter development is available at the moment when at least two of the largest building societies in the country are refusing investments on share account, and are only willing to accept additional amounts on deposit account.

The question naturally arises as to the source of the amount of the increased investments in building societies, especially having regard to the fact that many authoritative statements have been made to the effect that real savings during post-war years have shown a decline as compared with those of the pre-war period. No doubt there has been a tendency for investors in War Savings Certificates and Post Office and Trustee Savings Banks to invest an increasing proportion of their savings in building societies, but perhaps a considerable part of the income of such institutions is now derived from the investments of persons liable to full rate of income tax who take the opportunity to obtain an excellent, and which to them is a tax-free, investment. Table VI illustrates the slackening

TABLE V.

*Statement showing Indebtedness of Building Societies, with Head Offices Situated in Great Britain, on Share and Deposit Accounts.*

Year.	Total Value of Shareholdings at end of Year.	Total Value of Deposits and Loans, including Amounts due to Other Directors at end of Year. (a)	Percentage of Deposits, etc., as compared with Mortgage Assets.
	£1,000	£1,000	
(b) 1890... ..	34,745	14,918	30.8
(b) 1891... ..	34,082	14,760	30.9
(b) 1893... ..	(c) 30,456	(c) 11,366	28.0
(b) 1894... ..	(c) 29,893	(c) 10,643	28.0
1895... ..	(d) 34,568	(d) 17,601	40.8
1896... ..	34,330	18,990	44.4
1897... ..	34,017	19,865	46.3
1898... ..	33,962	21,326	48.9
1899... ..	34,459	22,345	50.0
1900... ..	34,966	21,622	47.4
1901... ..	35,443	22,093	47.2
1902... ..	36,407	22,768	47.3
1903... ..	37,506	23,868	47.4
1904... ..	38,533	24,516	47.1
1905... ..	39,769	25,457	47.8
1906... ..	41,180	25,810	47.4
1907... ..	42,303	25,628	45.6
1908... ..	43,585	25,307	44.1
1909... ..	44,637	26,036	44.7
1910... ..	45,621	26,569	44.5
1911... ..	(c) 43,922	(e) 15,894	(c) 26.6
1912... ..	44,504	15,863	26.4
1913... ..	45,561	15,974	26.3
1914... ..	46,489	15,868	26.0
1915... ..	46,417	15,328	25.6
1916... ..	46,705	14,396	25.2
1917... ..	46,582	13,623	25.0
1918... ..	50,128	14,058	26.4
1919... ..	56,617	16,184	28.0
1920... ..	63,865	18,320	26.6
1921... ..	70,862	19,072	25.3
1922... ..	80,430	20,975	25.1
1923... ..	93,483	24,395	24.7
1924... ..	108,983	28,107	23.5
1925... ..	127,827	32,362	22.2
1926... ..	147,739	35,711	20.9
1927... ..	172,818	38,568	19.5
(f) 1928... ..	213,235	41,383	18.2
(f) 1929... ..	250,225	46,811	17.5

(a) These other amounts are relatively insignificant.

(b) Including figures for Ireland. Figures for 1892 are not available.

(c) Decrease due to failure of Liberator Building Society in 1892.

(d) Increase due to inclusion for first time of 995 unincorporated societies.

(e) Decrease due to failure of Birkbeck Building Society in that year.

(f) End of year changed from 31st December to 31st January of year following.

of accumulation in other savings movements as compared with that in building societies.

TABLE VI.

*Total Amounts standing to the Credit of Investors at the End of each of the Years 1919–1929 in Various Thrift Organizations.*

Year.	Building Societies. (a).		Post Office Savings Bank.		Trustee Savings Banks. (b).		National Savings Certificates. (c).	
	£1,000.	Index	£1,000	Index	£1,000.	Index	£1,000	Index.
1919	72,801	100	(d) 266,348	100	71,918	100	298,000	100
1920	82,185	113	266,308	100	75,084	104	320,000	107
1921	89,934	124	264,157	99	73,083	102	387,000	130
1922	101,405	139	268,143	101	75,784	105	419,000	141
1923	117,878	162	273,071	103	79,566	111	446,000	150
1924	137,091	188	280,373	105	82,285	114	459,000	154
1925	160,189	220	285,491	107	83,396	116	476,000	160
1926	183,450	252	283,658	106	82,048	114	493,000	165
1927	211,386	290	284,650	107	81,402	113	483,000	162
1928	254,618	350	288,619	108	81,658	114	483,000	162
1929	297,036	408	(e) 285,000	107	79,331	110	(e) 480,000	161

(a) Amounts due to other creditors are included in these figures, but such are insignificant.

(b) At 20th November of year stated.

(c) At 31st March of year following that stated, and including accrued interest.

(d) This figure includes the amount of transactions in connection with the payment of gratuities to demobilized men of the Navy, Army and Air Force.

(e) Approximate.

Figures relating to Friendly Societies have not been included in Table VI, as, although such institutions are frequently regarded as thrift organizations, it is submitted that, owing to the fact that contributions are made for a definite personal service, such are not purely administered for purposes of saving. In any case the total funds of these institutions at the end of the period under review only showed an increase of approximately 70 per cent.

A consideration of the index numbers quoted in the table above shows that moneys remaining invested in building societies have increased since 1919 nearly fourfold,\* while those remaining invested in the Post Office and Trustee Savings Banks and National Savings Certificates have only increased at the rate of 7 per cent., 10 per cent. and 61 per cent., respectively. This fact clearly indicates the growing tendency among investors to regard building societies as equal to, if not better than, thrift institutions receiving the guarantee of the national government.

\* The author has here embodied the amendment suggested by Mr. Hilton on p. 203.

*Returns to Investors.*

As a general rule building societies offer a rate of dividend of either  $4\frac{1}{2}$  or 5 per cent. per annum free of income tax to shareholders, the former being the rate more prevalent in the north of England, while depositors are usually allowed from  $\frac{1}{2}$  to 1 per cent. less. These rates, however, are usually dependent upon the investments being made subject to certain specified periods for notices of withdrawal and also in many cases subject to the magnitude of the investment. Under such circumstances it is obvious that advertised rates are no true index as to the amount of dividend and bonus actually paid to members or of interest actually paid to depositors. Consequently an analysis has been made of the amounts actually rendered available for shareholders and of the amounts actually paid out as dividends, etc., in the cases of the societies included in the sample mentioned on p. 174. The following table (Table VII) gives the average rates obtained, such being based upon the figures of mean shareholdings of each of the 110 societies for the year 1929.

TABLE VII.

*Average Annual Rates of Dividends and Bonus Earned and Paid by 110 Building Societies, with Head Offices Situated in England, in each of Seven Principal Districts as Disclosed by Published Statements of Accounts for the year 1929.*

(Note.—Deposits are not included in this analysis.)

District.	No. of Societies.	Simple Average Percentage Earned.	Simple Average Percentage Paid.	Excess of Percentage Earned.
Northern counties, including				
Yorkshire ... ..	34	4.8	4.2	0.6
Lancashire and Cheshire ... ..	12	5.9	4.9	1.0
Midland counties ... ..	14	5.0	4.3	0.7
Eastern counties ... ..	5	5.4	4.6	0.8
Western counties ... ..	10	6.2	4.7	1.5
London and district ... ..	16	6.0	4.8	1.2
Southern counties ... ..	19	5.8	4.7	1.1
All districts ... ..	110	5.4	4.5	0.9

It will be observed that the rates of dividend and bonus earned and paid in the case of societies with headquarters situated in the northern, midland and eastern counties are generally lower than those calculated in the case of the remaining districts. This is due, as previously stated, to the fact that charges to borrowers in the first-mentioned areas are usually at a lower rate than that charged in the south. It will also be noticed by reference to the last column

that in the three former districts the two sets of rates do not show as great a margin as in the case of the remaining districts. This fact would seem to indicate that costs of administration are comparatively lower in the former districts, and this actually is the case, as reference to Table XII will confirm.

In view of the low rate charged to borrowers in Lancashire and Cheshire, as compared with those charged in the southern areas (see Table III), it is surprising to find that the average percentage rate of dividends, etc., paid to shareholders in that district is the highest recorded for each of the seven districts. Percentage earnings, however, are 0·3 higher than the average rate of interest charged to borrowers in this district, a similar remark applying also to the case of the western counties. Reference to the averages contained in Table IX indicates the reason, it being there shown that the average proportions of reserves are exceptionally high in those two districts. Earnings on reserves are, of course, clear gains to societies.

Probably in almost every case dividends, bonus and interest paid by building societies to investors are paid free of income tax as far as the investor is concerned, building societies accounting direct to the Inland Revenue Department for income-tax liability in respect of such payments according to the provisions of one or other of two special arrangements which are known as Arrangement A and Arrangement B. Very few societies are now subject to the terms of Arrangement A, the vast majority having decided to adopt the procedure laid down by Arrangement B. Under the latter arrangement societies agree to be directly assessed for income tax payable under Schedule D upon the total amount paid or credited to investors for dividends, bonus and/or interest during the year preceding that of assessment. The rate of tax payable in such case varies according to the status of the investor and the aggregate amount of holding. In the case of dividends, bonus and/or interest paid to incorporated bodies and in cases where the aggregate holding of an investor is £5,000 or more, the society is liable for income tax calculated at the full standard rate. In all other cases the amount payable by the society is computed by taking one-half the standard rate and applying it to one-half of the total amount distributed by way of dividends, bonus and/or interest.

Another interesting analysis in regard to rates of dividend and bonus earned and paid is one with respect to the size of building societies. This has been carried out, and the results are set forth in the following table (Table VIII).

As far as earnings are concerned, there would appear to be no relationship between them and the size of the society, but it is

TABLE VIII.

*Average Annual Rates of Dividends and Bonus Earned and Paid by 110 Building Societies, with Head Offices Situated in England, Classified according to Mean Value of Assets as Disclosed by Published Statements of Accounts for the year 1929.*

(Note.—Deposits are not included in this analysis.)

Value of Mean Assets.			No. of Societies	Simple Average Percentage Earned.	Simple Average Percentage Paid.	Excess of Percentage Earned.
Up to	£50,000	...	9	5.2	4.6	0.6
£50,000	£100,000	...	19	5.9	4.6	1.3
£100,000	£150,000	...	12	5.3	4.6	0.7
£150,000	£200,000	...	11	5.6	4.4	1.2
£200,000	£300,000	...	11	5.1	4.4	0.7
£300,000	£400,000	...	10	5.4	4.4	1.0
£400,000	£600,000	...	9	5.3	4.5	0.8
£600,000	£1,000,000	...	8	5.6	4.8	0.8
£1,000,000	£2,000,000	...	8	5.3	4.5	0.8
£2,000,000	£4,000,000	...	6	5.2	4.3	0.9
£5,000,000	£10,000,000	...	4	5.7	4.8	0.9
£10,000,000	£20,000,000	...	2	5.5	4.5	1.0
£50,000,000	£60,000,000	...	1	5.2	4.4	0.8
All societies	...	...	110	5.4	4.5	0.9

interesting to observe that societies with mean assets valued at between £50,000 and £100,000 appear to do very well for their shareholders. The average interest charge to borrowers in this group is only 5.9 per cent. (see Table IV), whereas the rate of earnings on share capital is also 5.9 per cent. Apparently the cause of the similarity in the average rates earned as compared with average rates of charges to borrowers in this group and also in that of mean assets valued at between £600,000 and £1,000,000 is the fact that considerable investments are received on deposit account upon which a low rate of interest is paid. By this means a large proportion of the working capital of the societies is obtained at a cheaper rate than is paid to shareholders, the latter gaining to a considerable extent thereby. In addition, the average of reserve funds of societies in the former group is above the general average (see Table IX), and, as such funds are usually the result of the accumulation of undivided profit, any application of the moneys for mortgage or other investment purposes results in net gains for the societies.

#### *Reserves.*

The question of adequate reserves is a very important one from the point of view of building societies, as such institutions are under a moral duty to safeguard as far as possible the savings of



their members and depositors, the majority of whom undoubtedly belong to the working classes. Thus it should be the aim of societies to accumulate such funds to the utmost. The acquisition of reserve funds, however, is not only an advantage from a moral point of view; it is also a distinct gain from a material aspect. The society which has set aside from its profits an amount sufficient to produce such income as will cover its costs of administration is financially in a very strong position, and thereby able to withstand more easily any sudden variation in rates of interest, whether it be that charged to borrowers or that allowed to investors.

The problem of investment of reserves frequently gives rise to a considerable amount of controversy, some societies preferring to have all reserves invested in trustee securities, while others prefer to have them utilized in further mortgage business. In view of the fact that the time when building societies desire to realize investments is usually the time when all other holders are doing likewise, thereby causing market values to fall, it would appear to be the safest procedure to utilize reserves in procuring further mortgage business and to provide that the periods of notices of withdrawal required in respect of shareholdings should be as long as possible. The society which has, say, 90 per cent. of its shareholdings subject to six months' notice of withdrawal is in an exceptionally strong position to withstand a run.

Until recent years building societies have been more active in the northern half of England, where apparently they have made a stronger appeal to the thrifty. In those districts they have thus been in a more fortunate position relatively to accumulate larger assets and reserves and to be ready with advances when required for would-be house purchasers. One would rather expect, therefore, that the financial returns of the northern societies would show a stronger position in regard to reserve funds when compared with those issued by societies with head offices situated in other districts. This, however, is only borne out to a certain extent by the results shown in the following analysis (Table IX), but it will be observed that societies with headquarters situated in Lancashire and Cheshire are as a general rule in an exceptionally strong position.

It is surprising to find that the midland building societies compare so unfavourably in regard to reserves, but this may be accounted for by the fact that such societies have to face competition from adjoining northern societies, which offer lower rates to borrowers, and also from southern societies, which offer relatively higher rates to investors. Thus the midland societies are in the unfortunate position of having to offer low rates to borrowers and relatively high rates to investors in order to maintain business.

TABLE IX.

*Reserves of 110 Building Societies, with Head Offices Situated in England, Expressed as a Percentage of other Liabilities as Disclosed by Published Statements of Accounts for the year 1929.*

District.	No. of Societies.	Simple Average of Reserves expressed as a Percentage of other Liabilities.	Minimum and Maximum for each District.
Northern counties, including			
Yorkshire ... ..	34	6.4	2.3 -13.9
Lancashire and Cheshire ... ..	12	15.9	4.2 -48.8
Midland counties ... ..	14	4.0	0.04- 7.2
Eastern counties ... ..	5	4.6	3.2 - 6.8
Western counties... ..	10	9.2	3.2 -18.0
London and district ... ..	16	6.2	1.4 -20.0
Southern counties ... ..	19	6.1	0.9 -13.8
All districts ... ..	110	7.2	0.04-48.8

The results for the Lancashire and Cheshire district are remarkable, in view of the fact that each society included in the sample for that area is relatively a small one, the maximum mean assets recorded being less than £800,000. The society which returns the figure of 48.8 is one having mean assets of only £123,000.

An analysis of reserves has also been carried out according to the size of the society, and the results are appended (Table X).

TABLE X.

*Reserves of 110 Building Societies, with Head Offices Situated in England, Expressed as a Percentage of other Liabilities and Classified According to Size of Society, at the end of 1929.*

Value of Mean Assets.	No. of Societies.	Simple Average of Reserves Expressed as a Percentage of other Liabilities.	Minimum and Maximum for each Group.
Up to £50,000 ... ..	9	10.9	0.04-36.4
£50,000 " £100,000 ... ..	19	8.4	2.3 -17.1
£100,000 " £150,000 ... ..	12	8.9	1.7 -48.8
£150,000 " £200,000 ... ..	11	6.7	1.8 -18.7
£200,000 " £300,000 ... ..	11	6.7	2.5 -20.0
£300,000 " £400,000 ... ..	10	6.6	3.2 -13.9
£400,000 " £600,000 ... ..	9	5.5	4.1 - 8.9
£600,000 " £1,000,000 ... ..	8	6.1	2.2 -10.4
£1,000,000 " £2,000,000 ... ..	8	6.0	3.2 - 8.9
£2,000,000 " £4,000,000 ... ..	6	6.8	3.3 -12.4
£5,000,000 " £10,000,000 ... ..	4	4.6	2.7 - 6.4
£10,000,000 " £20,000,000 ... ..	2	3.7	2.9 - 4.4
£50,000,000 " £80,000,000 ... ..	1	3.5	—
All societies ... ..	110	7.2	0.04-48.8

An inspection of the figures included in the table above clearly indicates the superiority of the average small society as compared with the large society when considering the financial stability of such institutions. It has on several occasions been stated by persons of administrative authority in the building society movement that 5 per cent. is the figure which should be kept in mind in determining the rates of reserves to be maintained by any one society. Whether this figure is a sound one or not, it certainly would appear that the majority of small societies are well within the limit, while the majority of the large ones are well below the datum line. It is possible, of course, that the larger societies may not need to keep a large percentage of reserves, in view of the fact that their investors reside throughout the whole country and that consequently any run on building societies generally may not have such a damaging effect upon their finances as in the case of small local societies, where, should a run occur in a particular district, the result would probably be that almost all the investors would be giving notice of withdrawal. However, it is submitted that, should anything so unfortunate happen as a run on building societies, the larger societies may well regret that the percentage of their reserves is as low as it is, and that steps should at once be taken by them to increase the rates of their reserve funds.

#### *Cost of Administration.*

A good deal of controversy has been carried on during recent years in building society circles in regard to the economic advantages of large societies as compared with small ones. It is claimed that the large society is more economically administered and is stronger financially. The latter contention is disproved by the results contained in Table X, and it now remains to consider the problem of administrative expenses.

In order that costs of administration may be placed upon a comparable basis, the figures relating thereto, and which are contained in the various statements of accounts, have been adjusted such that costs include directors' fees (including any income tax paid in addition), staff salaries (including contributions to staff funds), auditors' fees, rents (including a charge of 5 per cent. calculated on the value of office premises, if any), rates, insurance, cleaning, printing, stationery, postage, subscriptions, advertising, enquiries, travelling, agents' commission, bank charges (excluding interest) and branch expenses. From the total of expenses included under those headings there have been deducted rents received from sub-letting and commission allowed on fire insurance premiums. In a few cases the latter item has been estimated, while in one or

two cases it has been necessary to deduct receipts on account of survey fees as apparently such have been included in directors' fees or salaries. The results obtained have been expressed as percentages of the mean assets in the case of each society, and the following table (Table XI) summarizes such results according to the magnitude of the society's assets.

TABLE XI.

*Costs of Administration of 110 Building Societies, with Head Offices Situated in England, Expressed as Percentages of Mean Assets as Disclosed by Published Statements of Accounts for the year 1929, and Classified according to the Size of Society.*

Value of Mean Assets.			No. of Societies.	Simple Average of Costs of Administration per £100 of Mean Assets.	Minimum and Maximum Averages included in each Group.
				£	£
Up to	£50,000	...	9	·87	·57-1·46
£50,000	„	£100,000	19	·83	·34-1·48
£100,000	„	£150,000	12	·87	·54-1·49
£150,000	„	£200,000	11	·78	·20-1·52
£200,000	„	£300,000	11	·64	·39-·94
£300,000	„	£400,000	10	·66	·46-1·02
£400,000	„	£600,000	9	·60	·41-1·06
£600,000	„	£1,000,000	8	·69	·31-1·48
£1,000,000	„	£2,000,000	8	·50	·24-·75
£2,000,000	„	£4,000,000	6	·50	·32-·89
£5,000,000	„	£10,000,000	4	·69	·25-·95
£10,000,000	„	£20,000,000	2	·65	·54-·76
£50,000,000	„	£60,000,000	1	·56	—
All societies	...	...	110	·72	·20-1·52

Although the lowest percentage cost of administration recorded was found to apply to a society with mean assets valued at between £150,000 and £200,000, yet the most economic size for a building society, as far as cost of administration is concerned, would appear to lie between £1,000,000 and £4,000,000 worth of assets. From personal knowledge of the data used in compiling the averages included above, I confirm what I said last June—namely, that a society with mean assets valued at a figure lying between £2,000,000 and £3,000,000 appears to be one which can be most economically administered. It might be observed, however, that it is quite possible for societies which return low average costs of administration at the present time to have done so throughout the whole course of their development, and to be able to continue to do so in the future. An analysis of the statements of accounts of such societies carried out in this direction would be very instructive.

An examination of costs of administration from the point of view of areas is interesting, and the following table (Table XII) sets forth the results obtained from such enquiry.

TABLE XII.

*Costs of Administration of 110 Building Societies, with Head Offices Situated in England, Expressed as Percentages of other Liabilities and Classified according to one or other of Seven Principal Districts for the year 1929.*

District.	No. of Societies.	Simple Average of Costs of Administration per £100 of Mean Assets.	Minimum and Maximum for each District.
Northern counties, including		£	£ £
Yorkshire ... ..	34	·58	·24—1·06
Lancashire and Cheshire ...	12	·63	·31—1·04
Midland counties ... ..	14	·59	·25—1·20
Eastern counties ... ..	5	·53	·41—·68
Western counties ... ..	10	·97	·50—1·48
London and district ... ..	16	·91	·20—1·52
Southern counties ... ..	19	·86	·41—1·48
All districts ... ..	110	·72	·20—1·52

The southern societies appear to be more costly to administer than are the northern ones, the figures of average percentage management expenses obtained in respect of the former being considerably in excess of those obtained in regard to the latter. This is easily explained in the case of London and district, where conditions of living are more expensive, and perhaps a similar reason exists to a certain extent in the case of the southern counties, but it is difficult to apply such reasoning to the case of societies with headquarters situated in the western counties. It would be beneficial, perhaps, for some of those societies to revise their administrative expenditure.

The various minima recorded in the last column of the table (Table XII) indicate that, given wise administration, building societies can be very economically administered. Accordingly, it should be the aim of all societies returning heavy relative expenditure on management to reduce such costs to a figure more comparable with the general average of £0·72. In addition, if I may be permitted to make such a suggestion, it would appear to be advisable to include courses in building society administration in all syllabuses now being issued by educational institutions undertaking instruction in secretarial practice, such administration surely being entitled under present conditions to rank as a profession.

*The Ideal Building Society.*

Recent advertisements issued by several of the more prominent building societies have included superlatives of varying degrees in regard to size, reserves, service, etc., and accordingly it occurred to me that it would be interesting to estimate, if possible, the most appropriate size of what may be termed an ideal building society, having regard to financial strength, economic administration, and service to investors and borrowers. In passing, it should be mentioned that the share capital of building societies is not limited in any way by the provisions of the Building Societies Acts. This fact, therefore, provides a great difference between the constitution of building societies and that of companies incorporated in accordance with the provisions of the various Companies Acts.

To facilitate the present enquiry the averages shown in Tables IV, VIII, X and XI have been summarized as follows (Table XIII) :

TABLE XIII.

*A Summary of the Averages contained in Tables IV, VIII, X and XI, together with Coefficients Representing the Ideal Size of a Building Society as Determined by a Combination of Results obtained from an Analysis of the Annual Statements of Accounts for the year 1929 Published by 110 Building Societies, with Head Offices Situated in England.*

Value of Mean Assets.		No. of Societies.	Rate of Interest charged to Borrowers. Table IV.	Percentage Earnings. Table VIII.	Rate of Dividends and Bonus Paid. Table VIII.	Percentage Reserves. Table X.	Percentage Costs of Administration. Table XI.	Coefficient. (See below for Method used.)
Up to	£50,000	9	5.7	5.2	4.6	10.9	.87	10.11
£50,000 „	£100,000	19	5.9	5.9	4.6	8.4	.83	7.89
£100,000 „	£150,000	12	5.9	5.3	4.6	8.9	.87	7.98
£150,000 „	£200,000	11	5.8	5.6	4.4	6.7	.78	6.52
£200,000 „	£300,000	11	5.4	5.1	4.4	6.7	.64	8.53
£300,000 „	£400,000	10	5.5	5.4	4.4	6.6	.66	8.00
£400,000 „	£600,000	9	5.6	5.3	4.5	5.5	.60	7.37
£600,000 „	£1,000,000	8	5.6	5.6	4.8	6.1	.69	7.58
£1,000,000 „	£2,000,000	8	5.5	5.3	4.5	6.0	.50	9.82
£2,000,000 „	£4,000,000	6	5.4	5.2	4.3	6.8	.50	10.82
£5,000,000 „	£10,000,000	4	6.0	5.7	4.8	4.6	.69	5.33
£10,000,000 „	£20,000,000	2	6.0	5.5	4.5	3.7	.65	4.27
£50,000,000 „	£60,000,000	1	5.8	5.2	4.4	3.5	.56	4.74
All societies	... ..	110	5.7	5.4	4.5	7.2	.72	7.89

The question now arises as to the method to be adopted to combine the averages included in Table XIII such that a result

may be obtained in order to discover, if possible, the most efficient size of a building society, endeavouring at the same time to avoid as far as possible any duplication in the averages utilized. It is suggested that the figures relating to charges, dividends, reserves and costs of administration might be utilized, the average relating to earnings being omitted, as such is reflected to a great extent in the figures respecting dividends and reserves.

The test which has been applied is as follows. The product has been calculated of (1) the reciprocal of average rate charged to borrowers (Table IV), (2) the average rate of dividend and bonus paid (Table VIII), (3) the average percentage reserve (Table X) and (4) the reciprocal of average percentage cost of administration (Table XI), and it has been assumed that the group returning the maximum product is the group corresponding to the size of the ideal society. The results, or coefficients, obtained are set out in the last column of Table XIII above. I would like it to be understood, however, that I do not claim that the method adopted is free from mathematical criticism, in view of the fact that a certain amount of duplication is bound to be present, but I do suggest that the products obtained afford some evidence as to the size of the ideal society.

The coefficients shown in Table XIII are extremely interesting, and especially that obtained in respect of the results relating to those societies included in the lowest grouping. In fact it is only exceeded by one other. My previous remarks, however, to the effect that building societies with assets in the region of £2,000,000 appear to be of the most economic size from the point of view of administration are ably supported by the coefficients obtained for societies with mean assets valued at between £1,000,000 and £4,000,000, the grouping of £2,000,000 to £4,000,000 returning the maximum result. It should be borne in mind, of course, that the coefficients included in Table XIII have been based upon averages, and that consequently coefficients computed in the case of individual societies might provide much more interesting information. If possible, it is intended to carry out such analysis in the near future.

It is of interest to note that, even if the average relating to percentage earnings be included in the method adopted to calculate the coefficients, the statements contained in the previous paragraph are unaffected, the relative position of the three groups in question not being altered, although the order of the remaining groupings would require slight amendment.

In view of the publicity undertaken by the very large societies and the wording of their advertisements, it is surprising to find

that the coefficients obtained from the averages relating to their groupings are much smaller than those obtained from the averages in respect of the remaining groupings. The cause of this, I believe, is to be found in the fact that such societies have progressed too rapidly, and that consequently enough attention has not been paid to the economics of such institutions. When the business of any organization is increasing rapidly it is, of course, very difficult to pay attention to detail, the principal developments requiring most attention, with the result that waste is bound to be present. Fortunately, judging by recent announcements, mortgage business of the large societies is tending to slacken. This fact, perhaps, will provide them with the opportunity to overhaul their organizations and to effect economies, thereby facilitating the opportunity to strengthen reserves.

### *Amalgamation.*

Before concluding this paper it would seem advisable to make a few remarks on the question of amalgamation among building societies, more especially in view of the fact that our President is also President of one of the largest societies in the country, and that he discussed the problem in the course of his address at the last annual general meeting of that society.

I think a consideration of the averages included in Tables X and XI clearly indicates that small societies are quite as strong financially and in most cases quite as economically administered as are large societies. In this connection I reproduce below (Table XIV) some of the results, which I obtained last June in analysing the statements of accounts of eleven small societies with head offices situated in a northern district, which comprises only about 190,000 inhabitants, in order that they may be compared with results obtained from the present enquiry.

Each one of the eleven local societies included in the above analysis had mean assets of less value than £500,000, and, in view of the fact that the locality selected was a northern one, one naturally expects to find that average rates relating to charges and investments are less than the averages for the whole of the country. Although the average rate for reserves is lower than that recorded in the larger investigations, it is above that which is frequently mentioned as the safety mark. A significant figure, however, is the average relating to costs of administration, which is lower than that obtained for the 110 English societies. It will also be observed that there is only a difference of 0.5 between the rates earned and dividends, etc., paid. Thus the problem of amalgamation need not unduly worry these societies, but, if ever union were decided upon, bearing in mind



TABLE XIV.

*Comparison of the Financial Results for the year 1929 of Eleven Small Building Societies, with Head Offices Situated in the same District, with those Obtained as the Result of other Enquiries relating to the same year.*

Classification.	11 Societies (One Small District)			110 Societies. (England)			31 Societies (Northern Counties and Yorkshire)		
	Aver- age.	Minimum and Maximum		Aver- age	Minimum and Maximum		Aver- age.	Minimum and Maximum	
	£	£	£	£	£	£	£	£	£
Simple average interest charge per £100 of mean assets ...	5.2	5.0	5.6	5.7	4.4	7.5	5.2	4.4	6.3
Simple average earnings per £100 of mean shareholding...	4.5	4.2	4.9	5.4	3.7	10.6	4.8	4.2	6.2
Simple average dividend, etc., paid per £100 of mean shareholding ...	4.0	3.9	4.4	4.5	3.6	6.5	4.2	3.8	4.7
Simple average reserves per £100 of other liabilities ...	5.8	2.3	13.9	7.2	0.04	48.8	6.4	2.3	13.9
Simple average costs of administration per £100 of mean assets	.67	.54	.81	.72	.20	1.52	.58	.24	1.06

the economic objectives of amalgamation, it would appear to offer decided advantages to the societies operating in that particular district.

Again, is it reasonable to expect strong societies to agree to amalgamate with societies which can offer no advantages by such action? Rather would it appear that it will be the weaker societies which will amalgamate among themselves, in order to strengthen their position and if possible to regain some of the business which will naturally tend to drift to the stronger societies. In addition, one must remember that local societies will always appeal to local residents, and provided that such societies are wisely administered—as the majority of them are—there is not the slightest chance of expecting them to agree to amalgamation.

There is another aspect of amalgamation to which attention should be given, but to which very little regard is usually paid, and that is the position of the investing shareholder. Will such member gain by an amalgamation of his society with another? In view of the fact that, almost without exception, both large and small societies with head offices situated in the same district are paying the same rates of dividends to their respective shareholders,

there would appear to be no advantage in amalgamation as far as he is concerned. It also follows that it invariably makes no difference to the investing shareholder whether the assets of his particular society increase in value or whether they remain stationary provided that the ratio of reserves remains satisfactory. His rate of dividend is usually unaffected. The only people to benefit by the growth of a building society, whether the growth be the result of normal increase in business or in consequence of amalgamation, would appear to be the directors and chief administrative officers and also the solicitors, surveyors and auditors.

### *Conclusion.*

In placing the foregoing results and observations before Fellows of the Society for their consideration, I would wish it to be appreciated that I do so without in any way being identified with a mission. Although I am the Secretary of a relatively small provincial building society, I hold no brief to expound the merits of small societies and to decry the advantages of the large society. Rather have I approached the analysis of statistics relating to building societies with the inquisitiveness of a student seeking for knowledge.

As far as I can ascertain, no statistical analysis of the building society movement as a whole has ever before been attempted other than the small enquiry which I undertook last June in order to produce some results dealing with a specific enquiry which I had in view, and, of course, the official enquiries undertaken by the Registrar-General of Friendly Societies. Thus I am somewhat in the position of a pioneer as far as private investigation is concerned. No doubt owing to this fact I have probably omitted to deal with matters which some Fellows may consider to be of more importance than those with which I have dealt. If this be so, something is certain to be said about such problems in the course of the discussion which is to follow, and accordingly I await with interest any suggestions for further investigation into the statistics pertaining to building societies which Fellows may care to offer. If as a result of this paper I shall have awakened the interest of students of social and economic problems in regard to the activities of building societies, I shall feel amply rewarded.

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### DISCUSSION ON MR. BRACE'S PAPER

SIR JOSIAH STAMP, before calling upon Mr. Hilton to propose the vote of thanks, said that in introducing this paper to the Statistical Society, it was recognized that the subject was intrinsically of very great interest to those professionally engaged in the building

society movement. That was obvious, but in any set of figures relating to social affairs which has moved with the extraordinary rapidity of these figures over the last two decades, there were bound to be also problems of statistical interest even of the most abstract kind, and it was to be hoped that the statisticians who were looking at the science in its overriding sense would also find food for comment in the paper. While comments were wanted from the building society angle, they were also required from the standpoints of methodology and statistics.

It was said to be a tradition in the Royal Institution that the speaker who spoke exactly from nine to ten on the stroke of the clock was expected to make his audience laugh at least twice; presumably not more and not less! Mr. Brace had qualified for the particular field of the Statistical Society by introducing a coefficient, and having done so, he had thus made the subject perfectly respectable for statistical friends; what sort of coefficient did not matter at present. He successfully trailed his coat in various other directions for people to tread on, and the paper in itself provided plenty of food for useful discussion. Sir Josiah said that he himself never believed in coefficients merely produced *ad hoc* until he saw controlling coefficients to show what kind of results they gave, as a control or check on the particular experimental one put forward. It might be that Mr. Brace had tried all sorts of coefficients, and for some mathematical or other reason chose this particular one. If he had not tried others, then it was for those who would criticize his coefficient to illustrate the possible pitfalls which came about by introducing some quite modest alteration in some factor entering into the coefficient. Anyone who had done practical work on the subject would recognize this difficulty.

MR. HILTON: I rise with great pleasure to move the vote of thanks to Mr. Brace for the paper he has read. I think many of us cannot have been fully aware of the increasingly important part that the building society plays in our economic and financial structure. It is a great advantage to me personally, and I am sure to many other Fellows, to have so wide a range of very important and significant facts brought together. We are very grateful to Mr. Brace for having done it.

I will confine myself to remarks on a few major points. From Table II, I see that about the year 1904 the ratio of sums advanced on mortgage during each year is about 1 : 6 of the balance due on mortgage; but when one comes to 1924, the ratio is about 1 : 3, and in 1929 it is about 1 : 4. Now if the general period of repayment were in fact about fifteen or twenty years, as stated, one would assume that the ratio would be about 1 : 7 or 1 : 10. A considerable part of this difference between what one would expect and what obtains appears to be due to some mortgages being redeemed within short periods. That, indeed, is stated by Mr. Brace. I am prompted to ask for more information as to what these short redemptions signify. Is it that the funds are lent in considerable part, not for the building of new houses, but for the purchase of existing ones? On p. 180,

Mr. Brace says, "It may be estimated that nearly 150,000 houses were purchased during the year with the assistance of building societies." That figure he relates to 220,000 houses built in the year. But can we assume that all these houses purchased during the year were new? If not, can the figures properly be put side by side? Could Mr. Brace tell us how much and to what extent the activities of building societies are creative of new houses, and to what extent the building society carries on the other business of lending money on title-deeds?

A small point in passing. On p. 188, Mr. Brace says that the building society figures have increased since 1918 nearly four times as rapidly as Post Office or Trustee Savings Bank figures. Here I think the author has understated his case. The building society figures appear to have increased at the rate of about 15 per cent. per annum, the Post Office and Trustee Savings Bank figures at less than 1 per cent. per annum, and National Savings Certificates at less than 5 per cent. per annum. Instead of "four times as rapidly" a more correct expression, I think, would be "fifteen times as rapidly"; but perhaps it is simplest to say that the building societies' figures have quadrupled while the Bank figures have increased but little and the Certificate figures have increased by only 61 per cent.

On pp. 191-2, Mr. Brace discusses the importance of reserves. I found myself wondering how far it was the proper object of a building society to accumulate reserves. They represent, I take it, withheld profits on past transactions; and the past thereby makes a gift to the present and the future. That principle, I imagine, can be carried too far. A second point: how far can one judge security solely by the magnitude of reserves? They add to security because they are an addition to assets in the balance-sheet of assets and liabilities. But a society with relatively small reserves may have large assets in the form of titles to property which represent a much greater value than the sums it has lent on the property. May not some of these be sounder financially than a society with large reserves which has lent up to a larger proportion of the value? Yet another question: if reserves are invested in other mortgage business, does not that impair their virtue as a safeguard against a run on the society? The essence of checking a run is ready cash, and, in any case, I cannot quite see how any title-deed assets, whether reserves or not, can be operative against a run. But is it part of the business of any society to keep cash against a run? Is not that the business of the banks? Cannot a building society whose assets well exceed its liabilities fall back on the banks for ready cash in an emergency? I should like to know more about the interconnection between building societies and banks. Is not the best safeguard against a run the "six months' notice of withdrawal"; and do not Mr. Brace's references to that point dispose of the idea that the same percentage of reserves is essential to security in a large as in a small society?

I have been struck by the frequent references in the paper to "size." We are all a little apt to look for the particular correlations that interest us, to the disregard of other perhaps more important possible correlations. To me, only one definite conclusion is to be

drawn from Table XI, which is that societies with less than £200,000 assets are apt to have rather heavier relative costs of administration. Above £200,000 there appears to be no particular association between size and other factors. Moreover, the wide ranges between minimum and maximum in each class suggest that there is probably a very low correlation between size and efficiency or economy. May the determinant not be rather a matter of the society's age, or its history, or its locality, or the type of its business, or the type of personality in control? I have some fear that this emphasis on size may obscure other real and more significant relationships. For this reason I feel dubious of the coefficients of ideality. Take the smallest and the largest groups. The relative coefficients are determined almost entirely by reserves and by the reciprocal of expenses, but the disadvantage of the small society in the matter of expenses of administration is overwhelmed by the advantage of reserves, so its index-number comes out at 10.11 as against the largest societies' 4.74. If it should turn out to be the case that the larger society needs smaller reserves and the smaller society larger reserves to give the same measure of security, these index-numbers of ideality would be quite different.

I hope Mr. Brace will pursue his collection and analysis of the facts relating to building societies and will on some future occasion give this Society the results of his further researches. For my part, he would add to the debt I already owe him if he would on that future occasion describe, for the benefit of such as myself, to whom the operations of building societies are unfamiliar ground, the nature of the activities in which such societies are engaged. In the meantime, I wish to express my gratitude and that of my colleagues for his most interesting and informative paper.

MR. BELLMAN : It is a privilege and pleasure to second the vote of thanks to my friend and former colleague, Mr. Brace, for his most interesting paper. I have often felt that building societies provided a fertile field for statistical enquiry, but the difficulty of securing adequate data from within the movement for a complete survey has heretofore proved a deterrent. Those who, like myself, have a special interest in this subject, are therefore grateful to Mr. Brace for breaking this new ground. The task he has undertaken needed to be done, and he has brought to light many and most interesting details.

In his concluding remarks Mr. Brace definitely invites criticism on the scope of his paper. It would be a poor compliment to him to ignore this, and I respond to the provocation of the invitation rather than as a result of any sense of disagreement with his treatment of the subject. In the first place, therefore, I would like to proffer one or two comments of a general nature. Firstly, I imagine it is possible for there to be more than one opinion as to whether the peak year of 1929 was the most suitable for investigation. At all events, any conclusion which may be reached should, I think, be subject to an important qualification. For the year 1929 can hardly be considered a normal year from the building society standpoint.

Anyone writing on building societies, say ten years hence, will probably rank 1929 as one of the years of abnormal activity and change which followed the war.

Mr. Brace has given us, especially in regard to the more noteworthy points, a view at a given moment of time. It would have been interesting if he could have discussed to a large extent trends and tendencies over a period of years. For instance, could he have provided some information on the social status of the persons for whom the building societies cater, especially on the mortgage side? Could he have told us something about their social grouping—whether middle class, working class and so forth—about their occupations, about the degree in which houses on which advances have been made are owner-occupied? It would have been interesting to have had a close comparison of the statistics relating to the "Permanent" and "Terminating" types of society. If I may use a metaphor suitable to your Presidency, sir, I have been interested in Mr. Brace's description of the engine, but would fain know something about the passengers, the freight and the "permanent" way.

Further, in a number of valuable tables he has provided us with various simple average rates of interest, together with their minimum and maximum range. I do not cavil at his use of the simple average, but it might have been instructive to hear the reasons which induced him to adopt this particular method, especially having regard to the fact that the range between the maximum and the minimum is, on his own showing, so considerable. Were his samples fairly evenly distributed as between the maximum and the minimum?

Mr. Brace tells us that he chose a number of balance sheets at random and then proceeded to arrange certain groupings according to the magnitude of the societies. His sample, he thinks, is fairly representative. While this may be the case, is he satisfied that the number of balance sheets analysed in a given group are truly representative of the number of societies actually within that group? I confess to a feeling of disquiet over any haphazard selection of balance sheets in a movement possessing so much variation in practice and procedure. Incidentally, why the percentages for the admittedly abnormal society quoted in Mr. Brace's introduction should be referred to at all is not clear to me.

Now to pass on to a few points of detail. In explaining the increase in share capital, has Mr. Brace paid sufficient attention to the redistribution of incomes which has been proceeding in recent years? And while the question of share capital is under review, could he have given us an analysis of the distribution of shareholdings over a period of years? This offers an interesting field for research, which has been rendered somewhat easier by the returns of shareholdings recently required by the Inland Revenue authorities.

Another related question is the extent to which the building society investor and depositor regard their investment as "permanent," that is, what the ratio of withdrawals to deposits and share capital is and whether this ratio shows a tendency to increase or decline.

Mr. Brace's analysis has clearly shown that the lower ranges of interest rates, etc. are very largely attributable to the societies operating mainly in the North of England. Their case is peculiar. Your predecessor in the Presidential chair, sir, had something to say on this when he wrote :

"The market for capital is thus not so perfectly organized that . . . all units of supply are interchangeable. Certain parts of the market are peculiarly well-organized, but there are other parts more or less shut off from the levelling influences of a market organization."

Many of these Northern societies and other small provincial societies have operated as one of "parts more or less shut off" from the market organization. While to enumerate the factors accounting for this would be interesting, it is more pertinent to note that the condition shows some signs of disappearing. On the one hand, the available evidence points that the investor, and even the small investor, is taking a wider view in his search for outlets for his savings, while the building society movement is now a matter of national interest rather than the province of small isolated groups.

As regards management expenses, is cheapness the only criterion of efficiency? Do Mr. Brace's statistics measure differences in service? Do they measure differences in that important factor of safety represented by the nation-wide spread of the mortgage risks achieved by the large society and by skilled management? This last question is of some importance, for it has to be remembered that the larger societies' management expenses include the fees and salaries of Directors and officers with special qualifications, including Architects, Actuaries, Chartered Accountants, Chartered Surveyors, Chartered Secretaries, etc. The distinction in the percentage of management expense as between the very large and the very small unit may possibly represent the difference between expert administration and amateurish and possibly part-time service.

This is not without bearing on the question of the reserves of the societies concerned. I would never argue in favour of a small reserve, but clearly the more skilful and technically competent the management, the less need there is likely to be to draw upon reserves. My own view is that the acid test of a society's soundness lies, not solely in the proportion of its reserves, but in the prudence and foresight with which its operations, particularly its mortgage business, are conducted. Mr. Brace has much to say that is debatable upon the form in which reserves should be held. He appears to favour the utilization of reserves in procuring further mortgage business provided the notice of withdrawal regarding shareholdings is as long as possible. This is a theory I could not support. I am reminded of the old question, "When is a reserve not a reserve?" and the classical answer, "When it is invested in the business."

In the world of reality in which we operate, investments in gilt-edged securities represent, by the general consent of competent financial authorities, the best form of holding a reserve, if that reserve is to be real and effective, and perhaps Mr. Brace in a further

development of the same theme will look as carefully at the question of liquid resources of reserves, as liquid resources are as important as hypothetical funds in reserve. Nor is the question of branch offices without influence on the management expenses of the larger societies. During the past few years these societies—or many of them—have opened a considerable number of branch offices in various parts of the country. But, like bank branches, these offices do not always attain full earning power until they have been established for an appreciable period. Thus the branch office policy of the larger societies may occasion some temporary inflation of their management expenses, although they may be expected to secure the reward of their enterprise in due course.

Again, and still thinking of management expenses, I revert to my suggestion that Mr. Brace's analysis must be regarded as applying to an abnormal period. Several large societies have during the past year resorted, or have decided to resort forthwith, to mechanization on a large scale. This should not be without ultimate influence on their management expenses. Incidentally, I was glad to observe that Mr. Brace very properly draws attention to the higher cost of living, of office accommodation, etc. as factors in the management expenses of the Metropolitan societies. On the other hand, certain of the smaller societies are sometimes managed in conjunction with an estate agent's business or a solicitor's practice, and there is not improbably a sharing of overhead expenses.

Since Mr. Brace is obviously interested in the question of management expenses, it would have been illuminating if he had taken the opportunity of making a comparison between building society management expenses and those of more or less kindred institutions. The comparison would have been illuminating. I hope Mr. Brace will feel able to deal with this on some future occasion.

I have spoken longer than I intended, but I want to make a final point. My friend Mr. Brace identifies himself with the management of what he describes as "a relatively small provincial society," and although he disclaims any mission, yet, while inviting us to reflect upon the merits of the smaller units in the movement, he omits to mention one very significant fact. It is that the undoubted tendency of the public is to place its confidence and its business with the larger units. Thus, taking the ten largest societies, five of which belong to London and five to the Provinces, the percentage increase in the amount advanced—a fair index—in 1929 against 1928 was 36.5, which compares with 28.5 per cent. for the eleven societies having assets of between £2,000,000 and £4,000,000—Mr. Brace's ideal societies. The difference is very much greater if smaller societies are compared. I hope Mr. Brace will allow me to retain this consoling thought.

I have, I realize, been more gently critical than complimentary in these observations. Knowing Mr. Brace, I believe this is what he would prefer. But perhaps I may be permitted to repeat the note on which I began. Mr. Brace has tilled virgin soil; he has opened up a field for further and more detailed research; he richly merits our unstinted thanks, and I am sure you will accord these very heartily.



MR. C. OSWALD GEORGE said he rose to encourage those better qualified than himself to speak in reference to the paper which had been so ably presented. There were one or two points he would like to raise. First, there was the question of the amount of investment in recent years. To his mind it was very interesting to know how far tax evasion had been one of the reasons for the very rapid rise in the amount invested in building societies, and he would for that reason second the suggestion made by Mr. Bellman, that the annual investments of individual shareholders would present a most fruitful source of enquiry.

With reference to Table XIII, all those present were no doubt interested in the method by which the coefficient indicating ideal size had been obtained. One speaker had suggested that there was not much difference between the rate of interest charged and the rate of dividends and bonus paid, and that these factors, therefore, had little effect on the coefficient, but it was noteworthy that if a society reduced the average rates charged to borrowers and paid to investors by 1 per cent. in each case, reducing, say, from 5 and 4 per cent. to 4 and 3 per cent., the society's coefficient would be reduced, since four times the reciprocal of five was more than three times the reciprocal of four.

One striking point in the paper was the weight given in the coefficient to the percentage of reserves. Making use of the figures in the paper classified according to district instead of those—classified according to mean value of assets—used by Mr. Brace, he had calculated the coefficient for societies in Lancashire and Cheshire, where reserves were apparently particularly high. He had only calculated it during the meeting, and might have made a mistake, but it appeared to lead to an interesting conclusion. Table III showed the average rate of interest charged to borrowers by societies in Lancashire and Cheshire as 5.6. Table VII showed the average rate of dividend and bonus paid by these societies as 4.9. In Table IX their average percentage reserves were given as 15.9, and Table XII gave their average percentage costs of administration as 0.63.

These figures, according to Mr. Brace's formula,

$$\left( \frac{1}{5.6} \times 4.9 \times 15.9 \times \frac{1}{0.63} \right)$$

gave a coefficient of 22.0 (more than twice the highest coefficient shown in Table XIII). It would therefore seem that acceptance of Mr. Brace's figures as a criterion of the ideal society led to the conclusion that the location of a society's head office in Lancashire or Cheshire was a more important factor than the value of its mean assets.

MR. S. C. RAMSAY said he would like to express his indebtedness to the Society for enabling him to hear Mr. Brace's instructive and interesting paper. There was only one point that occurred to him in connection with the paper, and that was what he would call the accidental risk dealing with localities. When Mr. Brace compared

the smaller with the larger society, rather to the detriment of the larger society, he wondered whether he had considered the question of how much the smaller societies, if at all, were affected by the more circumscribed nature of their areas. If a small society was operating in one industrial town, then that society was subject to greater risks, depression, and prosperity, than a society that might be larger and spread its risks over a larger area.

MR. R. À ABABRELTON said he wished to refer to this building society matter on what he might call the "working part" of it. Many years ago he was called upon to be an auditor of building societies, and he thus had an opportunity of looking into their inner working. It seemed to him in those days that the banks, as a rule, were rather against the building societies. He was told that if he took title-deeds of property to a bank, he would be able to get an advance straight off, without much enquiry, of about 5 per cent., but if he put the same building in a building society he would have to pay something like 6½ per cent. for any advance, and there would be considerable legal researches to be paid for, in addition, before the advance was granted. There was also the fact he could vouch for, that many years ago the cheques given by building societies had no stamps upon them. That continued for many years. Before the Government dared to alter it, the banks had asked for many years why building societies should be allowed a privilege denied to themselves.

Another point which had not been mentioned was that in years gone by it used to be the practice of certain men to get a jerry-built house into a building society, and they managed somehow to obtain a good advance upon it. Instead of continuing to pay the instalments for the amount advanced they soon defaulted, the consequence being that when the society wanted to realize on that particular building, it proved not worth the amount advanced. That form of swindle, he was glad to know, had now practically ceased.

It seemed peculiar that the term "Building Society" was used. The term "Building" instead of "House" was used because originally the idea was that a man should get a Parliamentary vote as the owner of a plot of land of the value of 40s., or more, and *build* a house upon it.

The great society which within the last few months had called itself "The National Building Society" was for many years known as "The National Freehold Land Society." It originally bought land for building purposes as just mentioned. After a time that society split into two parts, one being known as the "British Land Company," still existing under that name, which purchased large estates for the National Freehold Land Society to cut up into building plots.

In the early days of building societies the officers were as a rule unpaid, so that heavy expenses were thereby saved, and no interest charge was made for advances. In those days, members could receive a £300 advance and repay it in ten years without having paid any interest. The society managed to keep going by a system of fines, and those, combined with the free services of the officers,

enabled the society to carry on successfully. Sometimes large profits were made, sometimes heavy losses were incurred; but generally the old building societies just managed to meet their liabilities and were of considerable benefit to working-class members.

MR. CALVERT SPENSLEY joined in thanking Mr. Brace for his extremely interesting paper, and desired to accept the invitation to criticize contained in that paper. The first point to which he would like to refer was on p. 176, where Mr. Brace said that "post-war scarcity of housing accommodation was rendered more acute by the monopoly conferred upon the favoured few by the provisions of the Rent Restriction Acts." The "favoured few" were formerly something like 90 per cent. of the rent-paying tenants, and he believed there were still two-thirds of the rent-paying tenants who were protected. It seemed to him that the real cause of the post-war stoppage was the very high and abnormal cost of post-war building. No investor could possibly have been expected to put his money into building small houses costing £1000 each when he was certain that later on others would be able to build similar houses for £500 each. He would want a net rent of £60 for the £1,000 building in 1920; but when the cost of building fell to £500, how could he maintain that high rent in competition with others at a remunerative rent of £30?

On p. 179 Mr. Brace said that it was suggested that "as the costs of administration in such cases are borne by ratepayers generally, many of whom are already purchasing their houses with the aid of building societies, local authorities adopting the Act should be required to administer the scheme on a self-supporting basis." Mr. Spensley believed they were self-supporting; the rate of interest charged was fixed by the Ministry of Health, and the margin allowed in this, together with the Survey Fee and legal costs, ought to cover all the expenses, but if not, he would like Mr. Brace to say where the local authorities were that he alluded to. The extraordinary thing was that the building societies had managed to escape anything like serious competition from local authorities who could lend at 5 per cent. interest on 90 per cent. of £1,200 or £1,500; the latter ought to be very serious competitors. The figures given in the annual reports of the Ministry of Health showed that the amounts advanced by local authorities in England and Wales fell from £15,471,000 in 1925-6 to £7,528,000 in 1929-30. In the same period the building societies' figure had risen from £52,151,000 to £75,104,000, so that the local authorities' ratio fell from 30 to 10 per cent.

On p. 180, Mr. Brace estimated that out of a total of 220,000 houses built in Great Britain in 1929, nearly 150,000 houses were purchased with the assistance of building societies. Mr. Spensley thought that figure was too high. The number of new houses built in England in that year included over 60,000 built by local authorities and 50,000 subsidy houses. In Scotland 13,000 were built by local authorities and 3,700 were subsidy houses. None of the 73,000 local authorities' houses would have been purchased with the assistance of building societies, and he would imagine that in the case of a

number of the subsidy-built houses the owner-occupiers would obtain advances from the local authorities from whom they obtained the subsidies. In these circumstances he thought that 150,000 must be too high a figure for building societies, especially when it was remembered that insurance companies, banks and private investors (often through solicitors) were still doing a considerable amount of mortgage business.

Mr. Spensley hoped Mr. Brace would refer to the exemption from income tax which building societies enjoyed.

MR. HARGREAVES PARKINSON said he regretted that Mr. Brace in his admirable paper had stopped short of saying where his figures led him with regard to the future. Mr. Bellman had criticized the figures on the ground that 1929 was an abnormal year, but many people would say that the whole period since the war had been abnormal. Most leaders of building society opinion recognized that a substantial part of the rapid movement since the war originated with the housing shortage. Now that was passing away. Sir Enoch Hill of the Halifax Society, in a recent address, admitted that fact, but went on to say that in his opinion there had been, and there was continuing to be, a change in the general attitude towards house ownership. On that, apparently, he based his view that building society progress would continue. Quite obviously, it could not continue to show the rate of expansion of the last few years if the housing shortage did become less acute. Already one saw in the many housing societies around London some evidence of an effort to push the movement. Advertising was now becoming steadily more energetic year by year, and some of the London societies already employed people on commission to bring mortgage business to them. That was all evidence of a possible tendency for the demand for building society facilities to lessen; for that reason he thought the figures of the last ten years gave an insufficiently conservative view, as they were based on an abnormal period.

Another evidence of this abnormality was the different interest rates charged and afforded to investors by different societies throughout the country. This had admittedly led to some internal friction in the movement. It had been asserted that the societies with head offices outside London, which did business in London, had special prospectuses for the Metropolitan area, in which the rates were higher than those in other parts of the country. Clearly, such a state of affairs was essentially transient. It might be related to industrial depression in some of the Northern areas, or have been aggravated by the contemporary depression throughout Great Britain. That in itself was a transient phenomenon, and when Mr. Brace carried out his intention of going further into the question, it was to be hoped that he would deal with this aspect. Evidently the question of interest rates still agitated those within the movement. To quote Sir Enoch Hill again, that authority had recently declared that if ever building society rates were reduced, they would, in his opinion, have to come down in London first. Mr. Parkinson hoped, therefore, that Mr. Brace would supplement his lucid review of the

last few years by putting the whole matter into a contest with respect to the future; if he would do that his work would awaken the greatest possible interest.

The vote of thanks was then put to the meeting and was carried unanimously.

MR. BRACE replied as follows: I have a formidable array of questions to answer, and I shall certainly take the opportunity of replying to them at greater length in the *Journal*, but there are one or two points on which I should like to speak at present.

In the first place, our President, in introducing Mr. Hilton, had something to say in connection with the coefficient which I have adopted. I can assure him that I did consider various methods before finally deciding to adopt the one now used, but with regard to the first few positions I always obtained the same results. Of course that would be expected to be the case in view of the figures obtained in analysing the societies in the leading groups.

Mr. Hilton, in dealing with the question of reserves, was rather of the opinion that a properly managed society did not need to keep reserves, and suggested that in cases of a run application should be made to the banks for assistance. In my own experience I have found that the bank is most willing to help, but one must remember that it will always ascertain first of all the extent of the borrowing powers of the building society, how much money the society has on deposit, and so calculate the maximum amount which the society is free to borrow. I think that in general the banks are very well secured indeed with regard to the loans which they have made to building societies.

Mr. Bellman raised a point to which he paid a great deal of attention—the normal year. That was also referred to by Mr. Parkinson. It is difficult to know which year one can accept as a normal year. It seems to me that we do not know yet whether 1930 has been a normal year. I can say from my own experience that in my society we have exceeded all records, and I believe it is so in other societies. I think one or two of the big societies have shown a falling off in their mortgage business, and that may affect the movement as a whole, but until we have the results before us I think it is difficult to determine which year shall be accepted as a normal year. I agree with Mr. Parkinson that it would be impossible to decide which year since the war should be taken as a normal year.

Mr. Bellman put forward a suggestion that a comparison might be made between the costs of administration of banks and those of building societies. I think that any comparison of that kind would be very much in favour of building societies; but that it would be very difficult to obtain proper figures relating to costs of administration in regard to the banks, as the full information is not discoverable from the banks' balance sheets. Also it must be remembered that banks have undoubtedly vast amounts of what are called hidden reserves, which would simplify the question of administrative costs.

Mr. Spensley raised a point with regard to local authorities making advances under the provisions of the Small Buildings Acquisition Act, and suggested that they were paying their way with respect to administration. He mentioned that the borrowers paid a survey fee. Of course they do, but I do not think local authorities pay their way in connection with the administration of the Small Buildings Acquisition Act. It must be remembered that there is a good deal of work attaching to local authorities in administering the mortgages and watching them during the time the properties are mortgaged, also that there is expense in that connection. I believe a local authority is allowed a margin of  $\frac{1}{4}$  per cent.; I fail to see how a local authority can administer its advances on a  $\frac{1}{4}$  per cent. charge on the amount that is advanced, so that the cost of administration of the Act comes out of the rates.

I think I have touched on the main points, but I propose to reply to others that have been raised in my written reply for the *Journal*.

I thank you for the way in which you have received my paper.

With regard to the further points which were raised during the discussion, Mr. Brace wrote :—

Mr. Hilton said he was surprised to find that the ratio which the value of fresh mortgage business bore to existing mortgage assets was about one to four (see Table II), and stated that he would rather have expected it to be in the neighbourhood of, say, one to seven. I suggest that the reason for the high ratio is the fact that since 1921 the annual value of fresh mortgage advances has rapidly increased and until recently has shown no signs of slackening. In addition, although societies have tended during recent years to extend the mortgage term of repayment, redemptions are becoming more frequent owing to sales of mortgaged properties, while purchasers of the latter usually arrange for fresh advances.

My computation of 150,000 houses as having been purchased with the assistance of building societies for occupation was challenged both by Mr. Hilton and Mr. Spensley on the ground that it was too high a figure for new houses. I am unaware that I stated that the figure represented new houses. All I did was to exclude by estimate the cases where advances were obtained by existing owners and also those in which advances were arranged in respect of business premises. I believe, however, that the majority of them would represent purchases of new properties, the large societies doing extensive business in regard to new properties on the guarantee deposit system. Mr. Spensley further stated that he was of opinion that many new houses were purchased with the aid of advances obtained from banks. I cannot agree with him on this point. No doubt some are purchased in the manner suggested by him, but it is well known in building society circles that the banks do not like the type of business undertaken by building societies, since they are not prepared to grant advances of more than the trustee limit, and in any case they insist upon early and considerable reductions. I also believe that the number purchased with the aid of private mortgages is insignificant, the terms in such cases not being acceptable to the average borrower.

I thank Mr. Hilton for pointing out that I had understated the increase in holdings by investors in building societies. The paper has now been amended in this respect.

The question of reserves received a great deal of attention, and I did reply at the meeting to some of the remarks made by Fellows, but one or two further criticisms remain to be answered. Mr. Hilton suggested that possibly too much attention is given by building societies to the question of reserves. The reason that reserves are needed—and Mr. Bellman agrees with me—is that, although building societies only advance to those persons of whom good status reports are received, circumstances often arise where, through no fault of their own, borrowers fall into arrears and the mortgaged property has to be realized, often at a loss. Consequently societies should set aside reserves for such contingencies. Again, should a run at any time develop, the society with a good margin of reserves will always receive willing support from a bank. The reason I prefer reserves to be invested in further mortgage business is, as stated, that investments on mortgage do not show such frequent fluctuations in value as trustee stocks, but the reason I prefer withdrawals to be subject to, say, six months' notice, is that, although societies may permit immediate withdrawals, in the case of a run the required notice could be insisted on, with the result that by the time the date of withdrawal arrived it is possible the run would have been over. I think Mr. Hilton has overlooked the fact that a society has only a charge on mortgaged property to the extent of the amount of the principal money remaining due.

I quite expected a great deal of criticism in regard to the coefficients included in Table XIII. In fact, after the paper had been prepared, I at first decided to omit the section. On review, however, I came to the conclusion that there was some value in the computation, and I was fortified by the opinion of a Fellow of the Society. It would appear that our President did not quite approve of it, but unfortunately in the course of his remarks he offered no criticism. Mr. Hilton suggested, however, that the averages relating to reserves had too much effect in determining the size of the coefficients. But such effect would appear to be in order because, if societies having a high percentage of reserves decided to reduce them, they would either pay higher dividends or charge less to their borrowing members. Should this happen the net result might be that the coefficient would be affected only slightly. Mr. George stated that a society reducing its rates to borrowers and investors by 1 per cent. would show a relatively worse position, although the difference between the rates remained the same, namely, 1 per cent. Surely this is as it should be, because, assuming the reduction were from 5 and 4 per cent. to 4 and 3 per cent.—the figures he used by way of illustration—the investor would be receiving less of the income than he did formerly. Instead of receiving  $\frac{4}{5}$  as formerly he would only receive  $\frac{3}{4}$ . It is possible, however, that the ratio of reserves would then return a higher figure. Mr. George also drew attention to the high coefficient which would be returned for societies with head offices situated in Lancashire and Cheshire. Again I reply that this is to be

expected, since the averages for such societies show excellent results. Apparently societies with head offices situated in one or other of those two counties have been administered with exceptional ability and prudence. In view of Mr. George's remarks I append the following statement, which includes coefficients computed on the same basis as used for those contained in Table XIII.

District.	No. of Societies.	Rate of Interest charged to Borrowers. Table III.	Percentage Earnings. Table VII.	Rate of Dividends and Bonus Paid. Table VII.	Percentage Reserves. Table IX.	Percentage Costs of Administration. Table XII.	Coefficients (excluding Earnings).
Northern counties, including Yorkshire ...	34	5.2	4.8	4.2	6.4	.58	8.91
Lancashire and Cheshire ...	12	5.6	5.9	4.9	15.9	.63	22.09
Midland counties ...	14	5.4	5.0	4.3	4.0	.59	5.40
Eastern counties ...	5	5.3	5.4	4.6	4.6	.53	7.53
Western counties ...	10	5.9	6.2	4.7	9.2	.97	7.55
London and district ...	16	6.4	6.0	4.8	6.2	.91	5.11
Southern counties ...	19	6.1	5.8	4.7	6.1	.86	5.47
All districts ...	110	5.7	5.4	4.5	7.2	.72	7.89

Many suggestions for further investigation were submitted by Mr. Bellman, but unfortunately many of them were such that only the society concerned would be in a position to obtain the necessary information. For instance, the distribution of values of holdings by investors and depositors and information as to their withdrawals, while of considerable importance, could only be obtained by inspection of societies' ledgers, while an analysis of the social status of borrowers could only be prepared by an inspection of the various forms of application for advances. I submit, however, that the latter, even if accurate, would be of little use, with the exception of information as to owner-occupier. The former would appear to be that type of enquiry which could be usefully undertaken by the National Association of Building Societies by means of a questionnaire.

A statistical analysis of the annual statements of accounts covering, say, the past ten years has already been considered by me, but Mr. Bellman will admit, I feel sure, that it is very difficult to compare many of the results quoted in the present form of the annual statement of accounts with those published under the old form. However, I hope to do something in this direction in the near future, as in many cases three years' returns are now available on a comparable basis. Some of the results already obtained are very interesting. For instance, there appears to be a general tendency for the ratio of reserves to decline.

I hardly think that the increase in share capital during post-war years is chiefly the result of the redistribution of incomes as suggested by Mr. Bellman. Rather do I think that a different type of investor is being attracted to building societies, largely on account



of the heavy burden of direct taxation by way of income tax. Again, Mr. Bellman himself has admitted that recently there has been a great increase of investments solely owing to the fact that the money cannot be utilized in other directions, and I am not at all sure that all such investments will be withdrawn on a recovery in trade. When that type of investor has become appreciative of a dividend of 5 per cent. free of tax he may feel inclined to leave the money with a building society on such excellent terms.

I cannot appreciate Mr. Bellman's plea for the use of weighted averages. In my opinion the more interesting information is obtained when regard is had to the individual societies. In any case the majority of the averages representing the groupings would be unaffected to any considerable extent, the only cases likely to be affected being those groupings containing only a few societies, and those where the range of distribution is wide. I have calculated the weighted averages for two groupings in the reserve section where the range of averages shows the widest distribution. The weighted average obtained for the grouping £100,000—£150,000 is 7.8 per cent., whereas the simple average is 8.9 per cent., a difference of 1.1. That grouping contains twelve societies, but the range is from 1.7 per cent. to 48.8 per cent., this being the widest range of distribution in the whole series. The larger societies in the grouping apparently return the lower averages. The grouping £10 million to £20 million gives a weighted average of 3.5 per cent. and a simple average of 3.7 per cent. Only two societies are included in this grouping, the larger of the two again returning the lower average. Consequently the weighted average is lower. Weighted averages for the 110 societies would be largely affected by the figures returned in the case of the largest society.

Mr. Bellman suggested that the proportion which the total value of the mean assets returned in each grouping for the 110 societies bore to the total value of mean assets of all societies in each grouping should be computed. I endeavoured to obtain the latter information from the Registrar of Building Societies, but unfortunately it is not available. It could be computed, of course, but the task would be a formidable one for a private enquirer even if he were able to obtain a copy of the statement of accounts issued by each of the 1,012 societies.

In regard to the remark by Mr. Bellman that those societies returning high averages for costs of administration offer better service to their members, I suggest that members of building societies are more concerned with the rate of dividend received and rate of interest charged than with the status of the directors and chief administrative officers, while in the case of the small societies there is intimate contact between members and the officers. I think the remarks of Mr. à Ababrelton in this connection were of interest, and even Mr. Bellman mentions one of the advantages enjoyed by the small society.

Mr. Bellman has compared the increase in the amount advanced during the year 1929 by the ten largest societies with that obtained by eleven societies with assets valued at between £2 million and £4

million, and finds the percentage of the former to be greater than that of the latter. I am not at all surprised to learn that such is the case, especially in view of the greater expenses incurred in respect of advertising by the largest societies, but what I think would be of interest in this connection are the respective proportions of such total increased amounts which are advanced without the aid of builder-vendors' guarantees. I rather think the result would more than completely reverse that obtained by Mr. Bellman.

The point raised by Mr. Ramsay in regard to the risk attaching to the circumscribed area of operations of the small local society is important, and, of course, has been noted by me, but, as I pointed out last June, the societies operating in the depressed areas do not appear to have suffered thereby. In fact, in common with the whole movement, they appear to have continued to progress.

May I suggest to Mr. Ababrelton that he refer to the last few numbers of *The Building Societies' Gazette* for information relating to stamp duty on cheques issued by building societies.

Mr. Spensley takes exception to my remark to the effect that the Rent Restriction Act assisted the favoured few, and he suggests that probably 90 per cent. of rent-paying tenants benefited. His estimate is probably true as far as rent-paying tenants were concerned. My remark applied to the whole of the population. The result of the act in the great majority of cases was to benefit those persons who had been employed at home on work described as being of national importance, thus assisting them to retain possession of whole houses when under normal conditions they would only occupy a few rooms. I well remember that, in 1920, Dr. Bowley in analysing the statistics relating to housing came to the conclusion that the effective shortage of housing was not as bad as was publicly stated. I also remember suggesting to him at the time that the Rent Restriction Act had considerably aggravated the problem.

Mr. Parkinson's remarks relating to the future of building societies were interesting. Undoubtedly building societies will have some difficult problems to face in the years to come, and that would appear to be the chief reason why considerable attention should be paid to present tendencies.

As a result of the ballot taken during the meeting, the candidates named below were elected Fellows of the Society:—

Prof. Shankar Lal Agrawal, M.A.,  
B.Sc.

Norman Heslop Bilbrough

Richard Lewis Anthony Holmes

Leslie Horc-Belisha, M.P.

Harold George Lewis

Clayton Conyers Morrell, M.D.,  
L.R.C.S., L.R.C.P., D.P.H.

Harry Louis, M.P.

Ernest Benson Perkins

Kizakke Covilagam Kuttyettan  
Raja, M.O.H.

J. R. Mainwaring Simmons

*Corporate Representative :*

Harry Bradley, *representing the British Boot, Shoe and Allied Trades Research Association.*

## THE SOCIAL SURVEY OF MERSEYSIDE.

AN ANALYSIS OF MATERIAL RELATING TO POVERTY, OVERCROWDING,  
AND THE SOCIAL SERVICES.

By D. CARADOG JONES, M.A.

[Read before the Royal Statistical Society, February 17, 1931, the  
President, Sir J. C. STAMP, G.B.E., LL.D., D.Sc., F.B.A., in the Chair.]

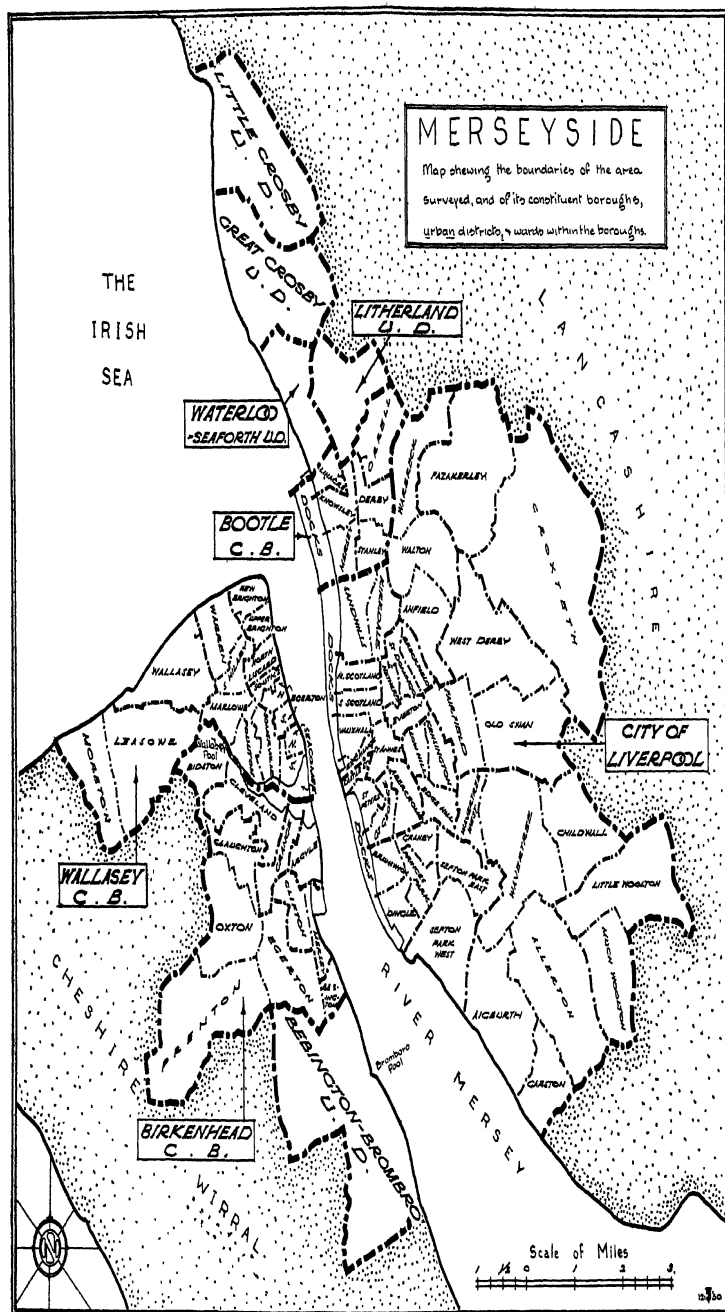
IN two previous papers some account has been given of a Survey of housing conditions in Liverpool. The analysis of our material has now proceeded to a stage at which it is possible to discuss poverty as well as overcrowding, and the Survey has been extended to take in the rest of the area defined by us for this purpose as Merseyside. The boundary is, of course, an arbitrary one. The area includes the four county boroughs of Liverpool, Bootle, Birkenhead and Wallasey, with the urban districts of Waterloo-and-Seaforth, Great Crosby, Little Crosby and Litherland, North of Bootle on the Lancashire side of the Mersey, and Bromborough, Higher Bebington and Lower Bebington, which are combined to form a single urban district south of Birkenhead on the Cheshire side. Anyone who looks at a map will see that these represent a compact group of rather densely populated areas.

Bootle, extending for about a mile and a quarter by the river-side and from one to two miles inland, contains the northernmost docks of the Liverpool system. The northern boundary of Bootle is, in fact, marked by the north wall of the last dock—the Gladstone. That part of the borough which is nearest to the docks resembles the corresponding area of Liverpool: it is equally squalid and overcrowded. Further out, however, conditions improve and open spaces appear. In Orrell Ward there is a large municipal housing estate.

As we proceed from Bootle towards Seaforth, Waterloo and Crosby the social atmosphere becomes more and more middle-class, and the houses eventually thin out into a straggling line along the coast. Inland and behind Seaforth is Litherland. One corner of it merges into Bootle, but to the north and east it develops into an untidy area of mixed middle and working-class houses.

Of the two county boroughs on the other side of the Mersey, Birkenhead is directly opposite Liverpool. Wallasey extends northwards to the far end of the Wirral peninsula and is completely cut off from Birkenhead by a long inlet known as Wallasey Pool, whose









advantages as a site for docks have been fully utilized. Communication between the towns is confined to a small number of road bridges and a very circuitous rail route. The two sides of the Mersey are connected by steam-ferry and underground railway, but a road tunnel is also in course of construction under the river which should greatly relieve the congestion of goods and motor traffic at this point between Liverpool and North Wales.

By virtue of the fact that some 14 per cent. of its working population, according to the 1921 Census figures, go to Liverpool to work, Birkenhead might almost be claimed as a dormitory of Liverpool, but it has also an industrial character of its own. Its industries are mainly those associated with the docks and shipbuilding yards. The docks have a quay length of about nine miles as opposed to Liverpool's twenty-nine. A part of the town in the neighbourhood of Hamilton Square presents the appearance of having been well-planned and allowed afterwards to degenerate. Wide spacious streets were laid out and a number of good houses built in the early part of the nineteenth century, but the houses have for the most part now become offices or fallen into a measure of decay. The rest of the town proper is composed of dreary streets of seemingly endless working-class houses. Variety is only afforded by some patches, especially near the docks, of really bad slums. The social status of the inhabitants improves the further one escapes from the centre. Rows of villas and new housing estates emerge, and these in turn are enclosed by a ring of middle-class suburbs, such as Oxtan, Prenton and Noctorum, until eventually, but before reaching the boundary of the borough, urban streets turn abruptly into hedged country lanes.

Wallasey is without the independent features of Birkenhead. It might be more fairly described as a bedroom of Liverpool, since over one-third of its occupied population spend the working part of their lives in that city. Before Wallasey became a borough the population was scattered over its surface in patches which have since been linked up by streets of villas so that it now appears to form one vast suburban area. The original nuclei are still easy to identify: for example, the older part of Wallasey village preserves a completely rural character. To the coast in that neighbourhood, which faces the open sea, holiday visitors are increasingly attracted. New Brighton is at the north-east corner of the peninsula. It has a long history as a seaside resort, and the sands there on a summer's day are still thick with day-trippers.

Inland there is a considerable area which is at present waste, or cultivated as small holdings and allotments. It is all ripe for urban development, and some parts have already been developed by private



enterprise. Random building estates have begun to appear, while in Moreton and Leasowe there is a fungus growth of squalid untidy bungalows, little more than wooden huts, interspersed with wheeled caravans. These are crowded together, often with only a few feet of space between them. They lack any drainage system and any proper approach other than a footpath or muddy lane. Here whole families have been living the year round, but the Corporation is now engaged, with commendable success, in the difficult task of rehousing the occupants.

The urban district of Bebington and Bromborough is more than half as large in acreage as the borough of Birkenhead. Much of this land also is or has been agricultural, but it is being gradually adapted to the ever-growing residential needs of Liverpool. Around Bromborough Pool, another inlet of the Mersey like Wallasey Pool on a small scale, is a large industrial area where Lever Brothers planted their works and built a pioneer model village some forty years ago.

Socially and industrially these Merseyside districts are closely knit together. When we pass outside their boundaries we either leave the riverside or we enter regions which are more sparsely populated or somewhat different in character. It may be said to be the accidents of development that have made them into many administrative units rather than one; as things are now it might be better for many purposes if they were one. A map in the Appendix shows the area surveyed, with the constituent boroughs, urban districts and wards distinguished.

To preserve consistency and comparability it seemed desirable to follow the same general lines as for Liverpool in the analysis of the housing data for the rest of Merseyside. This part of the paper has been severely pruned, but a certain amount of repetition has been unavoidable in recalling the methods of classification and standards previously adopted if the reader was to be spared a frequent troublesome reference back to the original papers.

In our Survey a random sample of 1 in 30 of all the inhabited buildings in the area was taken, and all which fell within a certain class, defined by the occupation of the head of the household, were investigated. The occupations included might be broadly described as of the type which are subject to the National Insurance Acts. The total number of inhabited buildings in Merseyside amounted to over a quarter of a million, and the number sampled was 8,543. These included many which for one reason or another were outside the scope of the Survey, such as institutions, public-houses, large shops and houses inhabited by non-working-class families. Some houses were occupied by more than one family. Particulars, more or less complete, were obtained concerning 6,906 families, or 93 per

cent. of those that were approached as being within the Survey. The number used in some of the tables which follow may differ slightly from this total because of lack of completeness in certain data.

TABLE I.

*Population, Size of Family and Relation of Families to Houses.  
Merseyside and Constituent Areas.*

Area.	Population					Persons per Family.			Families per House.		Mean No. of Rooms per House.
	1929 (000's)	Relative to 1901. 1901. 1911. 1921. 1929-30.				1911.	1921.	1929-30.	1921.	1929-30.	
MERSEYSIDE ...	1,304	100	111	121	132	4.70	4.46	4.18	1.16	1.18	5.27
<i>County Boroughs :</i>											
Liverpool ...	873	100	106	113	123	4.70	4.45	4.15	1.16	1.18	5.09
Bootle ...	80	100	116	127	134	4.96	4.80	4.61	1.18	1.16	5.39
Birkenhead ...	158	100	118	131	142	4.73	4.44	4.14	1.18	1.21	5.31
Wallasey ...	101	100	146	169	189	4.60	4.22	3.95	1.12	1.09	5.96
<i>Urban Districts :</i>											
Lancashire ...	67	100	130	145	159	4.71	4.44	4.27	1.10	1.08	6.04
Cheshire ...	23	100	128	162	210	4.91	4.60	4.22	1.07	1.02	5.11
<i>Wards :</i>											
<i>Bootle :</i>											
Mersey and Knowsley		100	95	103		5.03	4.75	5.11	1.33	1.21	5.40
Linacre and Orrell ...		100	147	170		4.94	4.86	4.37	1.11	1.12	5.03
Stanley and Derby ...		100	122	129		4.93	4.80	4.37	1.10	1.18	5.66
<i>Birkenhead :</i>											
Argyle ...		100	101	112		5.03	4.29	3.74	1.48	1.70	4.83
Grange ...		100	99	111		4.64	4.44	4.34	1.24	1.30	5.07
Cleveland ...		100	118	140		4.85	4.73	4.42	1.15	1.17	4.63
Clifton and Mersey ...		100	130	136		4.81	4.53	4.00	1.15	1.20	5.13
Others ...		100	136	153		4.51	4.26	4.07	1.10	1.11	6.22
<i>Wallasey :</i>											
Coastal ...		100	124	139		4.48	4.14	3.85	1.13	1.12	6.33
Others ...		100	183	221		4.83	4.31	4.02	1.10	1.07	5.54

In Table I is shown the estimated population in Merseyside and in each constituent area in 1929 and the growth of population relative to what it was in 1901. Indices of growth up to 1921 are also given for wards or grouped wards in each county borough except Liverpool. Figures have been given previously for Liverpool wards and so need not be repeated. It will be observed that the population of Merseyside has increased roughly by one-third during the last thirty odd years. This increase is due in part to extensions of boundaries, but for the Census years the figures in the table relate to the areas as constituted in 1921. Since that date Liverpool, Birkenhead and Wallasey have all taken in new territory. There has been a large increase of population in certain parts of Wallasey,

in Great and Little Crosby, and in Orrell (a district added to Bootle in 1904) which may be attributed mainly to residential development, but the numbers in Wallasey were swollen also at the last Census by the presence of summer visitors. The rise in Bebington and

TABLE II.

*Distribution of Families in Houses.*

Area.	No. of Families.	Structurally Separate Dwellings occupied by Families.				Percentage of Families living per House.		
		1	2	3	4 or more.	1	2 or 3	1 or more.
MERSEYSIDE ...	6,931*	3,116	624	104	52	73.8	22.8	3.4
<i>County Boroughs :</i>								
Liverpool ...	4,853	3,551	433	72	44	73.2	22.3	4.5
Bootle ...	449	328	52	3	2	73.0	25.2	1.8
Birkenhead ...	818	531	98	23	5	65.0	32.3	2.7
Wallasey ...	421	357	26	4	0	84.8	15.2	0
<i>Urban Districts :</i>								
Lancashire ...	275	238	13	2	1	86.6	11.6	1.8
Cheshire ...	115	111	2	0	0	96.5	3.5	0
<i>Wards :</i>								
<i>Bootle :</i>								
Mersey and Knowsley	150	102	19	2	1	68.0	29.3	2.7
Linacre and Orrell ...	161	129	14	0	1	80.0	17.5	2.5
Stanley and Derby ...	138	97	19	1	0	70.5	29.5	0
<i>Birkenhead :</i>								
Argyle ...	117	36	19	13	1	30.6	66.0	3.4
Grange ...	177	105	24	5	2	59.4	35.6	5.0
Cleveland ...	167	123	17	2	1	74.0	24.0	2.0
Clifton and Mersey ...	183	125	26	2	0	68.2	31.8	0
Others ...	174	142	12	1	1	81.5	15.5	3.0
<i>Wallasey :</i>								
Coastal ...	166	135	11	3	0	81.3	18.7	0
Others ...	255	222	15	1	0	87.0	13.0	0

\* This total includes some families which were outside the Survey, but which shared houses with families that were investigated.

Bromborough has been due in a large measure to industrial development associated with Levers' great soap-making works.

In the same table are shown the mean number of persons per family, families per house, and rooms per house in certain years. The decline in the size of family from 1911 to 1929-30 has been persistent and considerable. The particular figures given for 1911

and 1921 are based on Census records and relate to the whole population, while those for 1929-30 are, of course, based only on that part of the population sampled in the Survey, mainly working-class. In that class it is usually assumed that the birth-rate is higher and that it has been falling more slowly than in the general population. Had we been dealing with the general population, and had its birth-rate been falling at the same rate as between 1911 and 1921, the number of persons per family in 1929-30 in Merseyside would have been 4.27. Instead of that it is 4.18.

Again, it might be expected, bearing in mind the class bias in our sample, that the number of families per house in 1929-30 would be higher than the corresponding Census figure for 1921. For Merseyside as a whole it is so, but only slightly, and an examination of the constituent areas shows that it is lower in Bootle, Wallasey and the outlying urban districts. These general considerations—the big reduction in the size of family and the relatively slight difference in the mean number of families per house—lead us to anticipate some improvement in the general average of accommodation in Merseyside since 1921, but we must await the returns of the next Census for any precise statement of the position.

Table II shows the distribution of families in houses. Rather more than a quarter of all the families sampled were found to be sharing houses. The proportion is 27 per cent. in Liverpool and Bootle. It rises to 35 in Birkenhead and falls to 15 in Wallasey. The percentage of families living four or more to a house varies between 0 in Wallasey and 4.5 in Liverpool.

The mean number of families per house for Merseyside as a whole is 1.18 (see Table I). In the four county boroughs the figure does not differ greatly from this average. It is greatest in Birkenhead (1.24) and least in Wallasey (1.09). The Argyle Ward of Birkenhead is conspicuous with 1.70 families to the house. In this ward nearly 70 per cent. of all the families sampled were living in shared houses. In striking contrast is the urban district of Bebington and Bromborough, where practically the same number of families were sampled, and over 96 per cent. of them had houses to themselves. The sample taken from the latter district included a due proportion from the model village of Port Sunlight.

In discussing the relation of persons to rooms, the basis of the figures is a new standard of overcrowding which has been defined in detail in *J.R.S.S.*, 1930, IV. p. 502. According to this measure, 747 families, or 10.8 per cent. of the total sampled in Merseyside, were found to be living in overcrowded conditions. The proportion is remarkably similar in Liverpool (11.4 per cent.), Bootle (11.2 per cent.) and Birkenhead (10.6 per cent.) (see Table III). In Wallasey,

which is largely a residential area, it falls to 5.5 per cent. In certain wards the proportion is, of course, considerably higher : for instance, in the combined Mersey and Knowsley Wards of Bootle it is 18.7 per cent. ; in the Argyle Ward of Birkenhead it is 15.4 per cent. Relatively to the other areas, Birkenhead shows up better in Table III than in Table II. This may be in part explained by the prevalence of large old houses in certain parts of the town which are tenanted by more than one family, but they are not on that account necessarily

TABLE III.

*Distribution of Overcrowded Families in Tenements of Different Size.*

Area.	No. of Families.	No. Overcrowded.	Percentage Overcrowded.			Of Overcrowded Families Occupying Rooms.				
			All Tenements.	Un-shared Houses.	Shared Houses.	1	1½	2	3	4 or more.
						Percentage.				
MERSEYSIDE ...	6,903	747	10.8	8.5	17.4	12.1	6.2	15.1	55.0	11.3
<i>County Boroughs :</i>										
Liverpool ...	4,831	549	11.4	9.2	17.4	13.1	6.0	15.7	55.6	10.6
Bootle ...	449	50	11.2	7.0	22.4	22.0	8.0	6.0	42.0	22.0
Birkenhead ...	814	86	10.6	7.0	17.3	17.5	7.0	19.8	47.7	8.0
Wallasey ...	420	23	5.5	5.3	6.2	0	4.0	13.0	70.0	13.0
<i>Urban Districts :</i>						Number.				
Lancashire ...	274	34	12.4	11.8	16.7	0	3	3	23	5
Cheshire ...	115	5	4.3	4.5	0	0	0	0	4	1
<i>Wards :</i>										
<i>Bootle :</i>										
Mersey and Knowsley ...	150	28	18.7	9.8	37.5	7	4	1	11	5
Linacre and Orrell ...	161	17	11.2	7.8	22.0	3	0	2	8	4
Stanley and Derby ...	138	5	3.6	3.1	4.9	1	0	0	2	2
<i>Birkenhead :</i>										
Argyle ...	117	18	15.4	2.8	21.0	7	1	6	1	0
Grange ...	175	22	12.6	7.6	20.0	5	1	6	8	2
Cleveland ...	165	17	10.3	9.0	14.3	2	0	2	13	0
Clifton and Mersey ...	183	14	7.7	6.4	10.4	1	0	2	8	3
Others ...	174	15	8.6	6.3	18.8	0	1	1	11	2
<i>Wallasey :</i>										
Coastal ...	165	4	2.4	2.2	3.3	0	0	0	2	2
Others ...	255	19	7.5	7.2	9.1	0	1	3	14	1

overcrowded. Overcrowding is most conspicuous in tenements of three rooms, but there is a relatively high proportion of overcrowding also in two-roomed tenements in Liverpool and Birkenhead. The detailed figures in Wallasey are too small to be of much value.

Apart from the determination of the actual amount of overcrowding in the area of investigation, as judged by the houses sampled, an attempt has been made to estimate what part of it might be said to be closely associated with a condition of poverty. To try to measure

the proportion of families in Merseyside that might be described as living in poverty is also a problem of considerable importance in itself. With that in view we have defined in an earlier paper a "Poverty Line," the minimum income required by a family of given age and sex constitution in order to purchase the bare necessities of life. If we make an allowance for national insurance contributions, cost of travel to and from work, and rent on the basis of statistics actually collected in Liverpool, it is possible to indicate the sort of income level reached by typical families who are just on the Poverty Line. This is done in Table IV, where for comparison the figures are also given of Unemployment Benefit and Public Assistance granted under ordinary conditions (in the Liverpool area) to families of the same type in 1929-30.

TABLE IV.

*The Survey Poverty Line contrasted with Unemployment Benefit and Public Assistance for Families of Three Types.*

Constitution of the Family : Man, Wife and	Survey Poverty Line.	Unemployment Benefit.	Public Assistance (Poor Relief).
1 infant     ...     ...     ...	27s. 7d.	28s.	22s.
1 infant, 2 schoolchildren ...	37s. 7d.	32s.	29s.
2 infants, 3 schoolchildren ...	46s. 2d.	36s.	35s.

It will be observed that the Poverty Line figure agrees closely with the benefit given to an unemployed workman with a wife and one infant under the Insurance Acts. Had the child in the family been of school age instead of an infant, the former would have come out a trifle higher instead of a trifle lower than the latter. Considering that the Social Survey figure has been determined quite independently and rests indeed as much on a foundation of scientific theory as of practical experience, the agreement is striking. As the size of family increases the margin between the two widens, and for a family of seven it amounts to 10s. 2d. Here, however, we find that Public Assistance comes almost into line with Unemployment Benefit. The former stands at 35s. and the latter at 36s., whereas the Poverty Line has risen to 46s. 2d. The reader may be disposed to think the rise from 27s. 7d. to 46s. 2d. too steep, but when it is divided by four (since there are four more children in the larger family) it gives 8d. a day per child, with which provision has to be made for any extra accommodation, food, clothing, fuel and everything else that may be needed. That cannot be called extravagant. The corresponding allowance provided as Unemployment Benefit under the Insurance

Acts is about 3½d. a day per child, and the grant made by the Public Assistance Committee is about 5½d.

In the light of this let us ask what proportion of all the families sampled were found to be living in poverty as we have defined it. Taking the actual income recorded at the time of our investigation, and reckoning as income the aggregated earnings of all occupied members of the family together with any known income, *except* Public Assistance, received from other sources, the answer is given in Table V. In the whole of Merseyside the proportion of families below the Poverty Line was 16 per cent.; 9 per cent. had only about two-thirds or less of the income they needed, while 70 per cent., on the other hand, were found to have an income at least half as

TABLE V.

*Relation of Income to Poverty Line in A. All Families Sampled, and B. Overcrowded Families.*

Relation to Poverty Line.	Percentage of Families in									
	Merseyside.		Liverpool.		Bootle.		Birkenhead.		Wallasey.	
Above :	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.
Over 50% ...	70	48	69	47	73	50	68	53	75	43
0 to 50% ...	14	24	14	23	12	26	17	26	15	30
Below :										
0 to 33% ...	7	11	7	11	6	12	8	13	5	26
Over 33% ...	9	17	10	19	9	12	7	8	5	4

much again as they needed, to reach the Poverty Line. The proportions are similar in all the County Boroughs except Wallasey, where the percentage of families below the Poverty Line falls to 10.

Comparison of results in the different areas is to some extent affected by the fact that the Survey could not be made in all of them at the same time. The industrial depression which still persists became progressively more severe as the Survey proceeded. Its course can be measured by the changing figures of employment in the insured industries, and a rough estimate of its effect upon the numbers above and below the Poverty Line will be attempted presently, but the estimate can only be very hypothetical, and it is open to question whether it is not better to leave the figures as they stand in Table V, since they give a picture of conditions as they actually were in each area when the Survey was made.

When the new London Survey is completed it will be of interest to compare the proportion of poverty, as here defined, in Merseyside

with that in London. That will be broadly possible because our standard is virtually the same as that used in London, which is founded on the principles employed in Professor Bowley's Five Towns investigation. In the meantime it is worthy of note that in Bowley's Five Towns the combined percentage of families found to be above the Poverty Line was 92 per cent., with an additional 1.5 per cent. on the margin, in the actual week of investigation, which was in 1924 in four of the towns and in 1923 in the fifth. For all Merseyside the corresponding percentage was 84, and it would certainly have been still lower had it been possible to carry out the whole Survey at the time when the last area was completed. Existing poverty conditions in Merseyside approximate, in fact, more closely to those in the Five Towns immediately before the war, when the combined percentage above the Poverty Line was estimated to be 88 per cent., with a further 1 per cent. on the margin, *assuming full-time wages.*

In Table V, alongside the percentage of "All Families Sampled," is shown for each area the percentage of Overcrowded Families in the sample, also graded according to their position relative to the Poverty Line at the time of the investigation. In every borough the proportion of Overcrowded Families is definitely higher than the proportion of All Families Sampled below the Poverty Line. For Merseyside as a whole the proportions are respectively 28 per cent. and 16 per cent. This indicates that there is some association between overcrowding and poverty, but, in order to explore the matter further, our data must be subjected to the more refined analysis described in *J.R.S.S.*, 1930, IV. p. 506. It may be recalled that all the families sampled have been classified according to the number of adult male earners they contain, on the following plan:—

1. No earner.
2. No adult male earner.
3. One adult male earner.
4. One adult male with subsidiary earners.
5. Two or more adult males with or without subsidiary earners.

Classes 3 and 4 are subdivided into 3(1), 4(1); 3(2), 4(2); 3(3), 4(3); according as the chief earner is regularly employed, casually employed, or unemployed. Also, in 5(1) at least one adult male is in regular work, but in 5(2) no adult male is in regular work.

The percentages of all the families sampled found in different economic classes are shown in Table VI (A Rows) for Merseyside and each County Borough. Clearly the most common type of family is that of Economic Class 3(1), where there is usually a husband and father in regular work with a dependent wife and family of small



children. The next most common type is the same kind of family seen at a later stage when one or more of the young children have begun to earn, Economic Class 4(1). Between them these account for almost exactly one-half the families sampled in Merseyside, and the first type alone comprises nearly one-third of the total. Next come families without any earner at all or without any adult male earner (Classes 1 and 2 together—16.4 per cent.), followed by families with two or more adult male earners, one at least in regular work (Class 5(1)—12.5 per cent.). In 26 per cent. of all the families sampled containing at least one adult male, he was either unemployed or only casually employed at the time of the investigation.

In the same table (Rows B and C) are shown two special groups of families analysed in the same manner: (B) Families which were below the Poverty Line when investigated; (C) Families which were living in overcrowded conditions.

Before proceeding to examine this table in detail it is convenient to make a brief digression for the proposed estimate of the influence of changing industrial conditions upon the proportion of families below the Poverty Line. The greater part of the Survey of Liverpool took place in the autumn of 1929, that of Bootle in February and March, 1930, Birkenhead, Wallasey and the outlying districts of Lancashire and Cheshire in the summer of 1930. Had the whole Survey taken place in the autumn of 1929 the percentage of unemployment in Bootle would have been roughly 27 per cent. less than it actually was when the Survey was carried out there; in Birkenhead there would have been a corresponding reduction of about 23 per cent. and in Wallasey of about 12½ per cent. Now we not only know the number of families discovered below the Poverty Line in each area, but we also know in how many of them poverty was associated with lack of employment. There is a strong presumption that if the chief earners in these families had been fully employed, instead of being unemployed or only casually employed, the majority of them would have been raised above the Poverty Line. Remembering that the unemployed percentages quoted above relate to individuals, and that there may be more than one individual unemployed in a family, probably the best hypothesis we can adopt is that the number of families below the Poverty Line in which the chief earner is unemployed or casually employed in the districts outside Liverpool would have been reduced by about 20 per cent. if the whole Survey had been completed in the autumn of 1929. The effect of this is to reduce the percentage below the Poverty Line for Merseyside as a whole only from 16 to 15½ per cent. If we reverse the hypothesis and assume the whole Survey was carried out in September, 1930, a similar calculation raises the percentage below

the Poverty Line from 16 to 19 per cent. It should be noted that the unemployment percentages upon which this estimate is based relate workers to the areas in which they work, whereas in our household census they are related to the areas in which they reside. That

TABLE VI.

*Percentages of (A) All Families Sampled, (B) Families below the Poverty Line, and (C) Overcrowded Families found in Different Economic Classes.*

Area.	Families with						
	No Earner. 1.	No Adult Male Earner. 2.	One Adult Male in Regular Work with			The Chief Earner	
			No other Earners. 3(1).	Subsidiary Earners. 4(1).	Other Earners, including at least one Adult Male. 5(1).	Casually Employed. 3(2), 4(2).	Unemployed. 3(3), 4(3), 5(2).
<i>Merseyside :</i>							
A ...	6.2	10.2	31.3	18.0	12.5	11.7	10.1
B ...	17.8	13.6	2.8	1.7	1.0	23.3	39.9
C ...	2.5	7.8	16.1	25.8	13.0	17.1	17.7
<i>Liverpool :</i>							
A ...	6.6	10.9	30.4	17.3	12.1	12.8	9.9
B ...	18.3	14.0	2.3	1.0	1.2	24.3	39.0
C ...	2.9	7.8	15.7	25.5	12.2	17.5	18.4
<i>Bootle :</i>							
A ...	2.7	8.0	29.5	18.2	16.2	10.4	15.0
B ...	10.8	10.8	3.1	1.5	1.5	16.9	55.4
C ...	0.0	6.0	16.0	24.0	18.0	18.0	18.0
<i>Birkenhead :</i>							
A ...	6.4	7.0	35.4	19.3	10.4	10.7	10.8
B ...	22.7	8.4	4.2	6.7	0.0	23.5	34.5
C ...	2.3	7.0	20.9	25.6	10.5	17.4	16.3
<i>Wallasey :</i>							
A ...	6.9	12.2	36.5	18.3	14.2	5.2	6.6
B ...	7.9	26.3	13.1	0.0	0.0	5.3	47.4
C ...	0.0	8.7	26.1	26.1	13.0	8.7	17.4

\* Families of Class 5(2), containing at least two adult males and all either unemployed or only casually employed, have been generally included under this head and so described in the text. The division is justifiable though the description is not literally accurate for every family.

is an additional reason for treating the estimate as only a very rough one, but it is probably good enough to give some idea of the order of magnitude of the error introduced in our measurement of poverty by changing industrial conditions.

Our figures may have been affected in another way which deserves notice. While unemployment has increased, retail prices have fallen during the period covered by the Survey. The first factor tends to push families down below the Poverty Line, the second tends to pull them up above it, assuming wages are not

TABLE VII.

*Percentages of Families in Different Economic Classes found to be (B) Below the Poverty Line, and (C) Overcrowded.*

Area.	All Classes.	Families with						
		No Earner. 1.	No Adult Male Earner. 2.	One Adult Male in Regular Work with			The Chief Earner	
				No other Earners. 3(1).	Subsidiary Earners. 4(1).	Other Earners, including at least one Adult Male. 5(1).	Casually Employed. 3(2), 4(2).	Unemployed.* 3(3), 4(3), 5(2).
<i>Merseyside :</i>								
B ... ..	16.1	49.4	21.7	1.5	1.5	1.3	31.8	62.4
C ... ..	10.8	4.4	8.5	5.6	15.5	11.2	15.8	18.9
<i>Liverpool :</i>								
B ... ..	17.3	50.2	22.6	1.3	1.0	1.7	32.7	68.2
C ... ..	11.4	5.0	8.2	5.9	16.6	11.5	15.5	21.2
<i>Bootle :</i>								
B ... ..	14.6	63.6	20.6	1.5	1.2	1.4	22.9	53.7
C ... ..	11.1	0.0	8.8	6.0	14.7	12.4	19.1	13.2
<i>Birkenhead :</i>								
B ... ..	15.2	56.3	20.0	1.8	5.2	0.0	32.9	46.6
C ... ..	10.7	3.8	10.5	6.3	14.0	10.6	16.3	14.4
<i>Wallasey :</i>								
B ... ..	9.6	17.6	21.3	3.4	0.0	0.0	10.0	64.3
C ... ..	5.5	0.0	3.9	3.9	7.8	5.0	9.1	14.3

\* See footnote to Table VI.

altered. Out of all the families with recorded income in Merseyside it so happens that only very small proportions of the total were within 5 or even 10 per cent. of the Poverty Line on either side of it when investigated. This is fortunate, because it means that even if we assume a fairly big error in our figures, our conclusions as to the percentage below the Poverty Line will not be seriously upset, and we can scarcely be very sure as to the true position of families which are within a narrow margin of poverty as we have

defined it. The maximum variation in the cost of living during the period of the Survey according to the Ministry of Labour Index, which is our best guide for this purpose, was between 167 and 154, relative to 100 in July 1914. This represents a drop of 8 per cent. Now the proportion of all the families sampled within 5 per cent. of the Poverty Line and below it was only 1 per cent., and within 10 per cent. was only 2 per cent. The corresponding proportions above the Poverty Line were 1.4 per cent. and 1.5 per cent. We conclude that the fall in prices during the period of the Survey can only have caused a difference in the proportion below the Poverty Line which is likely to be well within the limits of possible error in the data, and in any case the difference would be such as to counter-balance to some extent the effect on poverty of the increase in unemployment during the same period.

Returning now to Table VI, certain general features of it strike one immediately, and, although there are natural differences in the precise percentages in the different areas, there is a consistency in their order which is remarkable. Comparing first of all the B Rows with the A Rows, we note that in every single area the B percentage is higher than the A percentage in Classes 1; 2; 3(2), 4(2); and 3(3), 4(3), 5(2). It is invariably much lower in the remaining classes, 3(1); 4(1); 5(1). We infer that families in which the chief earner is in regular work are rarely below the Poverty Line; but when there is no earner, or no adult male earner, or when the chief earner is employed only irregularly or falls out of employment altogether, then the family frequently falls below the Poverty Line. It is possible to bring this result out even more clearly by comparing the percentage of families in any economic class which are below the Poverty Line with the percentage of families of all classes which are below the line. This is done in Table VII (B Rows), where the percentage in each class is to be compared with the corresponding percentage for all classes in the same row. It appears that in the area as a whole more than three out of every five families sampled in which the head was unemployed were below the Poverty Line, and about half of that proportion were in the same plight when the head was not fully employed. Also, one-half of the families in which there was no earner at all fell below the Poverty Line, and about one-fifth when there was no adult male earner. On the other hand, in families of classes 3(1), 4(1), and 5(1), where there was at least one adult male in regular employment, the amount of poverty discovered was practically negligible. In none of these classes was the proportion falling below the poverty line higher than 15 per 1,000.

Diagram 1 gives a pictorial representation of the proportion of families in the Merseyside sample found at different grades above

and below the Poverty Line, distinguishing the various economic types. It brings out clearly (1) the steady rise in economic prosperity,

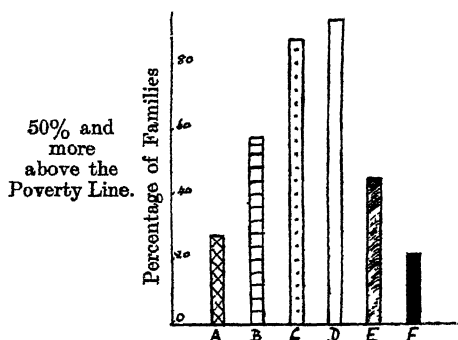
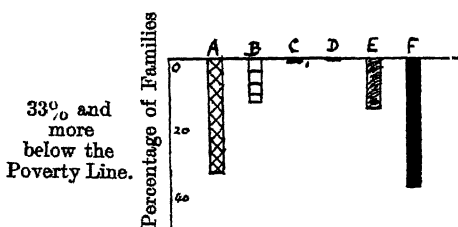
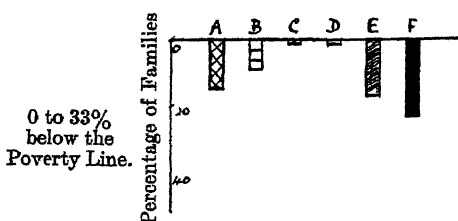
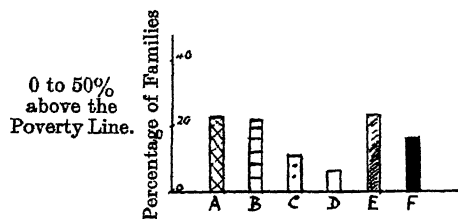


DIAGRAM 1.

*Families Sampled in Merseyside.*

The bars show the percentages of families of each economic type at different grades above and below the Poverty Line:—



A. *Econ. Class 1.* Families with no earner.

B. *Econ. Class 2.* Families with no adult male earner.

C. *Econ. Classes 3(1), 4(1).* Families with one adult male in regular work and with or without subsidiary earners.

D. *Econ. Class 5(1).* Families with at least two adult males, one being in regular work, with or without other earners.

E. *Econ. Classes 3(2), 4(2).* Families in which the chief earner is only casually employed.

F. *Econ. Classes 3(3), 4(3), 5(2).* Families in which the chief earner is unemployed. (See Note to Table VI.)

as the scale of earners rises from 0 to 2 adult males, and (2) the abrupt fall which results when the chief earner ceases to work regularly.

Let us next compare the C Rows with the A Rows in Table VI. In every area we now find the C percentage is higher than the A percentage in Classes 4(1); 3(2), 4(2); 3(3), 4(3), 5(2). It is invariably lower in Classes 1; 2; 3(1). It is of about the same order of magnitude in Class 5(1). Table VII, C Rows, tells precisely the same tale in another way. There the proportion of families found to be overcrowded in any particular economic class is compared with the proportion overcrowded when all classes are combined. It is clear that the percentages in Classes 1; 2; 3(1) are always less than the corresponding percentage for all classes in each area; the percentages in Classes 4(1); 3(2), 4(2); and 3(3), 4(3), 5(2) are always greater than the corresponding percentage for all classes; while the percentage in Class 5(1) is about equal to that for all classes. The figures for all Merseyside thus fully bear out the conclusions previously reached for Liverpool, that overcrowding is infrequently found in those classes which economically might be expected to be the most depressed, in that they contain no adult male earner or no earner at all. It is most prevalent, on the one hand, in families where the chief earner is altogether unemployed or only casually employed, and on the other hand in families where there is at least one adult male in regular work who is not the only potential earner in the family.

Summarizing the evidence of these two tables, we can say that poverty and overcrowding are sometimes associated, but not invariably. In families classed as 3(2), 4(2), 5(2), 3(3), 4(3), both may be seen together; in families classed as 1 and 2, poverty is frequently found, but overcrowding seldom; in families classed as 4(1) and 5(1), overcrowding is frequently found, but poverty seldom; while families of Class 3(1) are in the happy position where both poverty and overcrowding are comparatively rare.

#### DIAGRAM 2.

##### *The Relation of Poverty and Overcrowding to Economic Class.*

<i>Seldom Poverty or Overcrowding.</i>	<i>Seldom Poverty but Frequently Overcrowding.</i>
Econ. Class (3)1. One adult male in regular work, no other earner.	Econ. Classes 4(1), 5(1). One adult male in regular work and other earners.
Chief earner only casually employed or unemployed. Econ. Classes 3(2), 4(2), 5(2), 3(3), 4(3). <i>Frequently Poverty and Overcrowding.</i>	No earner or no adult male earner. Econ. Classes 1, 2. <i>Frequently Poverty but Seldom Overcrowding.</i>

These relationships are seen at a glance in Diagram 2, and, in order to assist the reader in visualizing the characteristics of the different economic classes, twenty families have been selected and a brief note about each has been given in an Appendix. They are not exceptional in any other sense than that no two families are ever exactly alike; they are otherwise typical of many which might equally well have been chosen. Moreover, except that we were careful to get a family in each case that should conform to the general character of its class, the selection of cards was purely at random. The cases have been arranged in four groups, as in Diagram 2, with headings to correspond.

We next wish to consider how many of the overcrowded families in our sample could probably afford a higher rent. In each area we have seen (Table V) that the percentage of overcrowded families above the Poverty Line lies between 70 and 80; in Merseyside as a whole nearly one-half the total of overcrowded families had, in fact, an income exceeding their minimum needs by 50 per cent. or more. But we cannot assume that all who are above the Poverty Line could without difficulty pay a higher rent. A criterion of ability has been proposed in *J.R.S.S.*, 1930, IV. p. 566, and according to that standard it appears that 56 per cent. of the families sampled and found to be living in overcrowded conditions could probably afford to spend more on rent than they actually were spending. The proportion was 52 per cent. in Wallasey, 55 per cent. in Liverpool, 60 per cent. in Bootle, 63 per cent. in Birkenhead. The criterion adopted is an arbitrary one, so that too much stress must not be laid on the precise figures, but their general tendency is clear and significant. We had already discovered that overcrowding is not always and necessarily associated with poverty: that would not come as a surprise to experienced social workers, but it will surprise many to learn that the higher cost of additional accommodation is probably not in itself the decisive factor against removal in quite half the cases of overcrowding investigated in Merseyside; and, if our sample is representative, we may assume the same to be true in other areas of like character. As we have traversed in a previous paper some of the reasons which account for families clinging to their old haunts, where they must put up with discomfort by day and maintain a sense of decency and self-respect by night only under difficulties, it is not necessary to pursue the subject further here.

In framing our criterion of ability to pay a higher rent, allowance was made for the fact that some part of the family income might be exceptional in character, dependent perhaps upon the ill-health or unemployment of the chief earner. The sources of such income are chiefly those which are commonly described as the social services,

and, since over a million pounds a day are spent—partly out of the public purse—in Great Britain upon these services at the present time, it is pertinent to enquire what classes of the community benefit by this expenditure? Surprisingly little is known as to the manner in which the benefits are shared between different classes, and any information we can glean about it may be of value. The subject is too large for adequate discussion in this paper, but it is possible, for instance, to make a broad comparison of their distribution between those families which are, economically, depressed and those which are relatively prosperous; or, again, between those which are living in overcrowded conditions and those which are housed in relative comfort. The comparison can only be a broad one, because we cannot be sure that income of this kind is always disclosed or otherwise known to the investigator. There is no reason to believe, however, that there is likely to be a very marked difference in the degree of disclosure as between the overcrowded and the comfortable, or the prosperous and the depressed.

The social services included in our analysis are Public Assistance, Unemployment and Health Insurance Benefits, Widows' and Old Age Pensions, War and Mercantile Marine Pensions, Civil Pensions, Blind Pensions and Payments under the Workmen's Compensation Act. The last-named payments are not included among the social services of which a Return is periodically made to Parliament. They do, nevertheless, represent a compulsory tax on industry, which is no doubt paid indirectly by the community. The most notable omissions from the list are the Educational, Housing and Public Health Services, where assistance is given in kind rather than in cash. Attention may be first directed to the wide spread of the services surveyed. The total number of families in receipt of some form of social income in our sample was 2,449, out of 6,780 where particulars of earnings were given. This would indicate that such income entered about 36 per cent. of the homes sampled. The actual proportion, if our figures were complete, would probably be higher; it is not likely that we should be far wrong if we assumed that, under present conditions, in at least two families out of every five of the type investigated some individual is in any given week drawing some form of State insurance benefit or pension.

It will be recollected that, of all the *families* sampled in Merseyside, the proportion overcrowded was 11 per cent. and the proportion below the poverty line was 16 per cent. The corresponding figures for families in relation to the social services have not been calculated, but, of all *individuals* enjoying some form of social income, the proportion living in overcrowded conditions was 14 per cent. and the proportion below the Poverty Line was 34 per cent. Since



overcrowded families are larger in size than families in general, we cannot infer with certainty from these figures that the benefits of the social services go more frequently to overcrowded homes than to other homes; we can, however, quite definitely say that they go more frequently to families below than to families above the poverty line.

TABLE VIII.

*Number and Proportion of Individuals, in Families of Certain Types, in Receipt of Different Kinds of Social Income.*

Group.	Number of Individuals in receipt of							Total Individuals in receipt of Social Income.
	Public Assist- ance.	National Insurance Benefits.		Pensions.		War Pen- sions.	Mis- cellane- ous.*	
		Un- employ- ment.	Health.	Wid- ows.	Old Age.			
All Families ...	487	834	177	267	857	288	121	3,031
Overcrowded Families ...	107	142	30	43	48	37	12	419
Families below the Poverty Line ...	423	296	84	69	114	38	13	1,037
Families above the Poverty Line ...	64	538	93	198	743	250	108	1,994

Proportion of Individuals.

All Families ...	16.1	27.5	5.9	8.8	28.3	9.5	3.9	100
Overcrowded Families ...	25.5	33.9	7.2	10.3	11.5	8.8	2.8	100
Families below the Poverty Line ...	40.9	28.5	8.1	6.6	11.0	3.7	1.3	100
Families above the Poverty Line ...	3.2	27.0	4.7	9.9	37.3	12.5	5.4	100

\* "Miscellaneous" includes Civil, Mercantile Marine, and Blind Pensions and Workmen's Compensation Payments.

In Table VIII a comparison is made of the extent to which the different social services supplement earned income in families of different types. The first half of the table gives the number of individuals benefiting, and they are expressed in percentage form in the second half. The proportions benefiting in families of all types can thus be readily compared with the proportions benefiting

that were living in overcrowded conditions, or above or below the Poverty Line, at the time when the investigation was made. It is possible that people might divulge the receipt of assistance of some kinds more readily than others, *e.g.* old age pensions more readily than unemployment benefit, and both more readily than public assistance. That would affect the comparison of the percentages in different columns, but it should not seriously affect the comparison of corresponding percentages in different rows.

Taking the figures at their face value and looking at the first row, it would appear that old age pensions and unemployment insurance are the most frequent sources of addition to the family income, each supplying between 25 and 30 per cent. of all the individual cases benefited. Public assistance comes next with 16 per cent., then war pensions, widows' pensions, and health insurance, all under 10 per cent. The remaining contributions are relatively small and have been combined together. Comparing with these the corresponding percentages for the group of overcrowded families, it is seen that comparatively few old-age pensioners were living in overcrowded conditions, but a high proportion of unemployed persons and persons in receipt of public assistance were overcrowded. The proportion of widows in receipt of pensions and of sick persons in receipt of benefit who were overcrowded also exceeded the average. Taking next families below the Poverty Line, their chief sources of extra income were public assistance and unemployment benefit, while families which were above the Poverty Line were assisted by old age pensions, unemployment benefit, and, in a less degree, by war pensions and widows' pensions.

In Table IX all individuals drawing income from any of these social services have been divided into four grades according to the position of their families relative to the Poverty Line. These percentages should not be judged individually but should be compared with those in the last column, as a standard, where all social benefits are combined. The comparison serves to confirm the previous conclusions and brings out more detail. It is immediately clear that people who are in receipt of public assistance are to be found, as is natural, in those families which, economically, are the most depressed. There is a relatively higher proportion of sick persons also in this depressed class than in classes which are more prosperous. Families may in the course of time become utterly poverty-stricken if the chief earners suffer continued ill-health. Relatively high numbers of unemployed persons are to be found in the two groups of families immediately above and below the Poverty Line. If unemployment persists for any length of time and benefit ceases the family is driven to the Public Assistance Committee for relief. This

probably accounts in part for the high percentage under public assistance and the relatively low percentage under unemployment benefit in the lowest income grade. With the help of unemployment insurance many families escape the lowest depths of poverty. The majority of women in receipt of widows' pensions are above the Poverty Line, many of them well above it. The same is true of families in which old age pensioners and persons in receipt of war pensions are found.

All the families sampled in Merseyside enjoying any form of

TABLE IX.

*Proportion of Individuals, in Receipt of Certain Kinds of Social Benefit, Occurring in Families of Different Grades of Income Relative to the Poverty Line.*

Grade of Income Relative to the Poverty Line.	Percentage of Individuals in each Income Grade in receipt of							
	Public Assist- ance.	National Insur- ance Benefits.		Pensions.		War Pen- sions.	Mis- cellane- ous.*	All Types of Social Income.
		Un- employ- ment.	Health.	Wid- ows.	Old Age.			
Above the Pov- erty Line:								
50% and more	6.4	39.4	36.5	54.7	68.1	74.3	72.8	47.9
0 to 50% ...	6.8	25.1	15.7	19.5	18.7	12.5	16.5	17.8
Below the Pov- erty Line:								
0 to 33% ...	8.8	24.6	13.0	12.4	7.8	4.5	4.9	12.9
33 to 100% ...	78.0	10.9	34.8	13.5	5.4	8.7	5.8	21.4
All Grades ...	100	100	100	100	100	100	100	100

\* "Miscellaneous" includes Civil, Mercantile Marine, and Blind Pensions and Workmen's Compensation Payments.

social income of the kind under discussion have also been analysed according to their economic class. Since the object here was to discover the extent to which families of different types derive income from different social services, when income comes into the same house from two different sources both sources are counted. The results are shown in Table X. In the first row of this table all the families sampled in the Survey are distributed according to the percentage found in each economic class. In the second row of the same table all families enjoying any form of social income, and in the subsequent rows all families enjoying some specified form of social income, are distributed into their economic classes on the

same percentage plan. The figures in each row may thus be compared with those in the first row, which may be regarded as the norm or standard classification for this purpose.

Comparing the second row with the first row of the table it is clear that families in which the chief earner is unemployed are those which draw most benefits from the social services. While they

TABLE X.

*Distribution of all Families in Receipt of certain forms of Social Income according to Economic Class.*

*Percentage of Families in Different Economic Classes.*

Group.	Families with							All Classes of Fam- ilies.
	No Earner. 1.	No Adult Male Earner. 2.	One Adult Male in Regular Work with			The Chief Earner		
			No other Earners. 3(1).	Sub- sidiary Earners. 4(1).	Other Earners, includ- ing at least one Adult Male. 5(1).	Casual- ly Em- ployed. 3(2), 4(2).	Unem- ployed.* 3(3), 4(3), 5(2).	
All Families Sam- pled ... ..	6.2	10.2	31.3	18.0	12.5	11.7	10.1	100
All in receipt of Social Income ...	15.0	14.8	9.3	9.4	11.8	14.9	24.8	100
All in receipt of In- come in form of :								
Public Assistance	26.0	11.0	2.5	2.5	5.5	13.4	39.0	100
Unemployment Benefit ... ..	0.0	4.2	0.4	6.5	18.7	27.5	42.7	100
Sickness Benefit	7.8	15.7	3.6	8.4	15.7	7.8	41.0	100
Widows' Pension	16.1	46.4	6.5	11.5	8.0	5.0	6.5	100
Old Age Pension	24.9	14.1	19.2	14.0	10.6	9.8	7.5	100
War Pension ...	12.7	20.5	22.6	14.2	8.5	10.6	11.0	100
Miscellaneous ...	20.6	19.8	16.2	12.5	10.3	11.0	9.6	100

\* See footnote to Table VI.

represent only 10 per cent. of all the families sampled in Merseyside, they form a quarter of all the families which are in receipt of certain forms of social income. If we look at particular services, it is possible to see their chief forms of benefit: they represent about 40 per cent. of all families in receipt of public assistance, of unemployment benefit, and of health insurance benefit. The type of family that profits most, relative to their numbers, after that which is hit by unemployment is that in which there is no earner at all. They represent only

6 per cent. of all the families sampled, but 15 per cent. of those which enjoy some form of social income, about a quarter of those in receipt of public assistance and of old age pensions, and 16 per cent. of those in receipt of widows' pensions. Next come families in which there are earners, but no adult male earner. They form 10 per cent. of all families sampled, but nearly 15 per cent. of all in receipt of social income, about the same percentage of those drawing sick

TABLE XI.

*Percentage of Families in Receipt of Different Kinds of Social Income.*

Group.	Families with							All Classes of Fam- ilies.
	No Earner. 1.	No Adult Male Earner. 2.	One Adult Male in Regular Work with			The Chief Earner		
			No other Earners. 3(1).	Sub- sidiary Earners. 4(1).	Other Earners, includ- ing at least one Adult Male. 5(1).	Casually Em- ployed. 3(2), 4(2).	Unem- ployed.* 3(3), 4(3), 5(2).	
All in receipt of In- come in form of :								
Public Assistance	29.1	12.4	4.5	4.5	7.8	15.2	26.5	16.8
Unemployment Benefit ...	0.0	7.8	1.1	19.1	43.6	51.0	47.5	27.5
Sickness Benefit	3.0	6.2	2.2	5.2	7.8	3.1	9.7	5.8
Widows' Pension	9.9	28.7	6.4	11.2	6.3	3.1	2.4	9.2
Old Age Pension	43.0	24.7	53.2	38.6	23.3	17.0	7.8	25.9
War Pensions ...	8.4	13.8	24.2	15.0	7.2	7.2	4.4	10.0
Miscellaneous ...	6.5	6.5	8.4	6.4	4.2	3.5	1.8	4.9
	100	100	100	100	100	100	100	100

\* See footnote to Table VI.

benefit and old age pensions, 46 per cent. of those drawing widows' pensions, and 20 per cent. of those drawing war pensions. Next come families in which the head is only casually employed. They form 12 per cent. of all families sampled, 15 per cent. of all in receipt of social income, and 27.5 per cent. of all in receipt of unemployment benefit. Taking together all families in which an adult male is in regular employment, these represent 62 per cent. of all the families sampled, but only half that percentage of families benefiting by the social services: they account between them for rather over a quarter

of all the families in receipt of unemployment benefit, sickness benefit and widows' pensions, and about 44 per cent. of all the families in receipt of old age pensions and war pensions. These families are the economic backbone of the population sampled. It is true that they contain an element which, though classed as regular to-day, may be classed as unemployed to-morrow, but on the whole they certainly pay most into the Social Services and, in view of their numbers, draw least out of them. Moreover, a large proportion of the earners in these families are steadily producing and not simply consuming the produce of others. The fact that many of them provide a home for old age pensioners and so contribute to their extra comfort and support is also to their credit. It is interesting to note that only a quarter of all the families containing old age pensioners in our sample were of the type with no earner, where these old people are probably living alone either single or married.

In Table X the proportions of families of different classes benefiting from each separate type of social service were shown. In Table XI we look at the same matter from a different angle: we find in what proportions families of each separate class are in receipt of different kinds of social income. The percentages in each column can be appropriately compared with those in the last column where families of all classes are combined. The proportions opposite different services in this last column differ slightly from those in the first row of Table VIII, because the unit there was the individual benefiting, and here it is the family, but there is only one marked difference: several instances occur of husband and wife living together and both in receipt of old age pensions; they, of course, count as two individuals but as one family, hence the proportion under this head is less in Table XI than in Table VIII.

Examining now the different economic types of families, we see that of those without any earner, over 70 per cent. receive their social income in the form of old age pensions or public assistance. Of families with earners but no adult male, over half draw their benefits in the form of widows' pensions or old age pensions, and over a quarter as war pensions or public assistance. When the chief earner is unemployed, nearly one-half of the families assisted are in receipt of unemployment benefit, and over a quarter of public assistance. When the chief earner is casually employed, the element of unemployment benefit is most conspicuous, but old age pensions show a higher percentage than public assistance. The bulk of the families containing at least one adult male in regular work but no other earners are assisted by old age pensions and war pensions, but these become increasingly less important, and unemployment and sickness benefit become increasingly more important as we pass to

families with one adult male and subsidiary earners, and on again to those containing more than one adult male earner. This suggests that in such families the additional "earners" are not infrequently purely potential: many of them represent extra mouths to feed rather than extra hands to produce.

It is possible without reflection to take an optimistic view of the figures presented in this paper, to persuade ourselves that, with only 11 per cent. of the sampled families overcrowded and with only 16 per cent. below the Poverty Line, conditions are not so bad as they might be in view of the unparalleled economic depression which darkens the whole civilised world. As to overcrowding, one can estimate its amount, as we have done, but that gives no adequate conception of the pitiable conditions under which many of the families concerned are condemned to live, with often but a single room in which both the small and great events of life can be staged—eating and sleeping, birth and death. Nobody with a sensitive imagination who has had personal experience of such conditions, even as a casual visitor, can rest satisfied to leave them as they are. It is not our function in this Survey to do more than describe what we have found, leaving it to others to point the way to improvement. This, however, our analysis has clearly shown: overcrowding is a problem which should be attacked in two parts, only one of which is fundamentally associated with poverty.

In judging the amount of poverty discovered in our sample, it must be remembered that no account has been taken of any addition to family income in the form of Public Assistance, on the ground that such addition is presumably made only if it is deemed that the family (or individual) concerned would otherwise be destitute. It might not unfairly be described as income given by the State out of charity, for it has not been earned by the recipient either directly or indirectly. But in theory there is little to distinguish uncovenanted\* benefit granted to an unemployed worker under the Insurance Acts from Public Assistance; the only difference is that in practice one is administered by an Insurance authority and the other by a Public Assistance Committee. To ordinary unemployment benefit the worker who is normally in regular employment is, of course, entitled by reason of his contributions to the Insurance fund; but uncovenanted benefit is not covered by such contributions, neither has it been earned. The giving of it is as much an act of charity on the part of the State as the giving of Public Assistance to save the worker and his family from starvation. Even at present, when unemployment drags on for so long that the worker fails to pay 8 weekly

\* The original term "uncovenanted" best describes the form of benefit which was afterwards re-christened "extended" and again "transitional."

contributions in the two years preceding his claim, or 30 over the whole period of his insured life, he ceases to be entitled even to uncovenanted benefit and is thus virtually driven to the Public Assistance Committee for relief. If his family are not supported out of Insurance funds, they must be supported by somebody. Hence, if it were possible in our sample to distinguish uncovenanted benefit from ordinary actuarial benefit, there would be equal justification for excluding it in reckoning the family income as there is for excluding Public Assistance, and there is little doubt that more families would then be brought below the Poverty Line. In short, if we regard a family as being in poverty if they fail to reach the minimum standard without outside assistance, then it is clear that 16 per cent. is not the full measure of poverty in our sample. It is also clear from our analysis that the class of families which suffer most from poverty and overcrowding, which draw most upon the Social Services and contribute least to them, are those in which the head is unemployed or only casually employed. In so far as Merseyside is concerned there can be no question that the problem of insufficient employment is the most pressing of all social problems at the present time. Those who are so fortunate as to be in regular work are compelled to carry a heavy burden of unemployed and half-employed workers. A great part of this burden is the inevitable consequence of our loss of export trade, but it is not unlikely, indeed it is highly probable, that some persons are being carried who by better organization and better administration might be set on their feet to walk.

The main facts and figures which emerge from our analysis may now be shortly summarized :—

1. The area defined as Merseyside, in which a random sample of families was investigated, contains four County Boroughs—Liverpool, Bootle, Birkenhead and Wallasey—and five Urban Districts, together embracing a total population of roughly 1½ millions.

2. Rather more than a quarter of all the families sampled were found to be sharing houses. The proportion rises to 35 per cent. in Birkenhead and falls to 15 per cent. in Wallasey, which is largely a residential area.

3. The mean number of families per house for Merseyside as a whole was 1.18. The figure does not differ greatly from this in the constituent boroughs.

4. Out of a total of nearly 7,000 families sampled, 11 per cent. were found to be living in overcrowded conditions. The proportion is remarkably similar in the individual boroughs, excepting Wallasey, where it is reduced by one-half.

5. Overcrowding is most frequent in tenements of three rooms.



Liverpool and Birkenhead also show a relatively high proportion of overcrowding in two-roomed tenements.

6. A "Poverty Line" has been defined which varies with the number in the family, taking into account sex and age. For husband, wife and one infant it is drawn at a level of income roughly equal to the sum prescribed at present as unemployment benefit for such a family.

7. 16 per cent. of all the families sampled in Merseyside were below the Poverty Line; seven out of every ten families had an income 50 per cent. or more above the line. Again the proportions were remarkably alike in each borough, except Wallasey, where only 10 per cent. of the families sampled fell below the Poverty Line.

8. Of all the overcrowded families sampled in Merseyside, 28 per cent. were below the Poverty Line, the percentage in the individual boroughs varying from 21 to 30.

9. Families containing only one adult male, in regular work, with or without subsidiary earners, made up about half the total sampled in the Survey. The head was either casually employed or unemployed in over a quarter of all families containing at least one adult male.

10. Families in which the chief earner was in regular work were seldom in poverty, but 62 per cent. of the families in which the head was unemployed and about half that proportion when the head was not fully employed were below the Poverty Line. One-half the families with no earner and about one-fifth the families with no adult male earner were also below the line.

11. The relation found between overcrowding and poverty may be stated as follows:—

Poverty and overcrowding are found conspicuously together in families where the head is unemployed or only casually employed. They are rarely to be seen in the most prevalent type of family, consisting of an adult male in regular work supporting a wife and small children. Where there is no earner, or no adult male earner, there may be, and there frequently is, poverty, but there is seldom overcrowding. Where there are more earners in the family than one adult male who is regularly employed there may be, and there frequently is, overcrowding, but there is seldom poverty.

12. It is estimated that more than one-half of the families living in overcrowded conditions could probably afford to pay a higher rent: many of them could move into better surroundings if that were the only consideration which weighed with them.

13. Earned income is supplemented by income from certain defined Social Services. Under existing conditions in Merseyside at least two families out of every five of the type surveyed probably enjoy some income from such sources at any given time.

14. It cannot be definitely inferred from the data obtained that overcrowded families benefit from these Social Services more than other families, but it is perfectly clear that those who are below the Poverty Line benefit much more than those who are above it.

15. Of the services considered, old age pensions and unemployment insurance add most frequently to the family income, accounting between them for 50 to 60 per cent. of all the individuals benefited.

16. Relatively few old age pensioners, but a high proportion of unemployed persons and of persons in receipt of Public Assistance, were found to be living in overcrowded conditions.

17. Those who are in receipt of Public Assistance are found generally in what are, economically, the most depressed of all families. A high proportion of sick persons is also in this low income class. The unemployed mostly belong to families which are not so far below the Poverty Line, or which are even a little above it. Many old age pensioners, and those in receipt of widows' or army pensions, are well above it.

18. Families in which the chief earner is unemployed represent only one in ten of all the families sampled, but they represent one in four of those which are in receipt of some form of social income.

19. On the other hand, families in which the chief earner is in regular work make up over 60 per cent. of all the families sampled, but only about half that proportion of those in receipt of social income.

20. Of families without any earner benefiting from the Social Services, nearly three-quarters draw their benefits in the form of old age pensions or Public Assistance; of those with no adult male earner, over half are in receipt of widows' pensions or old age pensions.

21. When the chief earner is unemployed, unemployment benefit accounts for nearly a half and Public Assistance for over a quarter of the families with social income. When there is only one earner in the family, an adult male in regular work, old age pensions and war pensions are the chief sources of benefit.

22. In Merseyside at the present time the problem of insufficient employment is the most pressing of all social problems, those who are persistently producing being obliged to carry the additional heavy burden of those who frequently are merely consuming.

My thanks are due to Mr. T. W. Sharp for kindly drawing the map showing the districts covered by the Survey, and to all who have assisted in the analysis of material for this paper; Mr. C. T. Saunders has helped me very considerably in the laborious task of preparing the tables, and I should like his name in particular to be associated with its publication.

## APPENDIX.

NOTES DESCRIPTIVE OF TWENTY HOUSEHOLDS ILLUSTRATING THE  
RELATION OF POVERTY AND OVERCROWDING TO ECONOMIC  
CLASS.

## SELDOM POVERTY OR OVERCROWDING.

*Economic Class 3(1). One adult male in regular work, no other earner.*

1. 3(1). Above Poverty Line. Not overcrowded.

Plumber (28) in a big shipyard. Has a wife and 9-weeks-old daughter. Earnings last week—which included one day on strike—45s. Needs \* 20s. 2d. Rent 13s. 4d. (unrestricted) for two bedrooms, kitchen and scullery.

2. 3(1). Above Poverty Line. Not overcrowded.

A joiner (41) employed by a Railway Company. Wife, and son of 14. Earns 66s. 4d. as a joiner. Also earns £45 a year and lives rent free as caretaker of a chapel. Total weekly earnings 83s. 8d. Needs 23s. 5d. Has three bedrooms, parlour, kitchen, scullery, larder, bath, yard and garden.

## SELDOM POVERTY BUT FREQUENTLY OVERCROWDING.

*Economic Classes 4(1), 5(1). One adult male in regular work and other earners.*

3. 4(1). Above Poverty Line. Not overcrowded.

A ferry engineer (44) with wife, three daughters (21, 19, and 14) and two sons (18 and 16). Head's pay, 95s. Two eldest daughters employed by printer, one son by a property repairer, the other by a grocer. Total family earnings 167s. Needs 52s. Rent 11s. 9d. (restricted) for three bedrooms, parlour, kitchen, scullery and bathroom.

4. 4(1). Above Poverty Line. *Overcrowded.* Could afford a higher rent.

A labourer of 49, employed by a large firm, with a wife, three daughters (20, 16 and 3) and five sons (19, 14, 9, 7, 7). Two eldest daughters employed as domestic servants, eldest son as a labourer. Father's earnings 60s. Total income 125s. Needs 60s. 11½d. Rent 4s. 6d. for two bedrooms,

\* The "Needs" throughout this Appendix are in addition to what is actually paid in rent for the present accommodation. They represent the minimum income needed to provide food, clothing, fuel, light and cleaning materials for the family.

kitchen, scullery and yard in a house shared with one other family. Two of the children sleep out with their grandmother two doors away.

5. 4(1). Above Poverty Line. *Overcrowded*. Could not afford a higher rent.

A capstan man (37), employed by a Railway Company, with a wife, mother-in-law, two sons (16, 8 months) and four daughters (14, 11, 7, 4½). Eldest son employed as checker by the same Company. Head's earnings 55s. Total family income 67s. 6d. Needs 52s. 9½d. Rent 5s. 8d. (restricted) for two bedrooms, kitchen and a scullery.

6. 5(1). Above Poverty Line. Not overcrowded.

An unemployed ship's stoker (49) with a wife, a married daughter (26), a son-in-law (29), a male lodger (48), four other daughters (24, 16, 14, 9), two sons (12, 7) and two grandchildren (4, 2). Head received 23s. Unemployment Benefit. Son-in-law a fitter, lodger a casual labourer, daughters of 16 and 14 both Silk Works' hands. Total family income 164s. 7d. Needs 78s. 4½d. Rent 13s. (unrestricted) for five bedrooms, two parlours and kitchen, together with scullery, larder, yard and one w.c.

7. 5(1). Above Poverty Line. *Overcrowded*. Could afford a higher rent.

A railway engine driver (48) with wife, three sons (24, 23, 8) and six daughters (20, 18, 14, 12, 6, 4). Head earns 90s.; two eldest sons, tool-setter and yardman. Eldest daughter a shop assistant. Daughters of 18 and 14 both unemployed; former a domestic, and uninsured, latter a factory worker but under insurance age. Total family income 204s. Needs 68s. 3½d. Rent 9s. 1d. (restricted) for three bedrooms and a kitchen, with a scullery, larder, bath, yard; one tap and one w.c.

#### FREQUENTLY POVERTY BUT SELDOM OVERCROWDING.

##### *Economic Classes 1, 2. No earner or no adult male earner.*

8. 1. Above Poverty Line. Not overcrowded.

A man and wife, both 73. Six children away from home. Head a retired employee of a semi-public Company from which he gets a pension of £1 15s. 3d. Both also receive old age pensions. Total income 55s. 3d. Needs 12s. 4d. Rent 10s. 7d. (restricted) for three bedrooms, parlour and kitchen. Also a scullery and small garden.

9. 1. *Below Poverty Line.* Not overcrowded. Two brothers of 69 and 60. Both were dock labourers, but elder brother too old to work and younger incapacitated by failing eyesight. Elder has old age pension and 10s. public assistance. Total income 20s. Needs 15s. 10½d. Rent 6s. 6d. (unrestricted) for one room in house containing ten families. Four w.c.'s, one tap for house.
10. 2. *Above Poverty Line.* Not overcrowded.  
A waitress (32) at a large hotel with two illegitimate children of 9 and 2; allowance of 10s. for younger child. Wages 29s. Tips average 7s. 6d. Total income 46s. 6d. Needs 16s. 10d. Pays 4s. rent for bedroom and parlour, and shares kitchen, tap and w.c. with principal tenant, to whom she pays rent.
11. 2. *Below Poverty Line.* Not overcrowded.  
A deserted wife (27) with a son of 4. Her last job was that of a waitress in the Isle of Man (15s. and food), but she has been unemployed for three weeks. No unemployment benefit. Last week's only income was 10s. public assistance, given in kind. Needs 12s. 6d. Rent 3s. 6d. for single room in house containing two other families. Shares scullery, tap and w.c.

#### FREQUENTLY POVERTY AND OVERCROWDING.

*Economic Classes 3(2), 4(2), 5(2), 3(3), 4(3). Chief earner only casually employed or unemployed.*

12. 3(2). *Above Poverty Line.* Not overcrowded.  
Dock labourer (26) with wife and son of 1 year. Earnings 66s. Needs 20s. 9½d. Rent 9s. 6d. (restricted) for two bedrooms, kitchen and scullery.
13. 3(2). *Above Poverty Line. Overcrowded.* Could afford a higher rent.  
Dock labourer (36) with a wife and two children of their own (2 and 4). Also house two other children (11 and 7) whose mother is dead and whose father has deserted them. Earnings last week 54s. Needs 32s. 9d. Rent 7s. 2d. (restricted) for two bedrooms and a kitchen.
14. 4(2). *Above Poverty Line. Overcrowded.* Could afford higher rent.  
A dock labourer (52) with a wife and daughter of 19 who works as a bottle-cleaner. Head earns 60s., daughter 16s. One bedroom sublet for 4s. rent. Total income 80s.

Needs 24s. 3<sup>1</sup>*d.* Gross rent paid to landlord 8s. 6*d.* This family use one bedroom only and share parlour, kitchen, scullery and yard with sub-tenants. Two water-taps, two w.c.'s.

15. 4(2). *Below Poverty Line. Overcrowded.* Could not afford a higher rent.

A casual sailor's porter (50) with a wife, a daughter of 14 and two sons (12, 9). Father puts "full-time" earnings as 12s., but earned last week only 7s. Daughter employed as messenger and earns 6s. Family receives 12s. 5*d.* public assistance. Total income last week 25s. 5*d.* Needs 31s. 9*d.* Rent 8s. 6*d.* (restricted) for two bedrooms and a kitchen.

16. 5(2). *Below Poverty Line. Overcrowded.* Could not afford a higher rent.

Head and wife of 75 live with son of 50, daughter of 44, her husband (52), and their three children (daughters, 16, 10 and a son of 14). Head retired—last job that of night watchman. He and his wife receive old age pensions. Son of 50 is a dock labourer, but is unable to work and awaiting compensation for an accident. The daughter's husband is a greaser, but is unemployed. The girl of 16 is at a School of Art. Total income last week 50s. Needs 52s. 4<sup>1</sup>*d.* Rent 13s. (restricted) for three bedrooms and kitchen, together with scullery, bath, yard, one water-tap and one w.c.

17. 3(3). *Below Poverty Line.* Not overcrowded.

An unemployed seaman (42) with wife and four children (13, 10, 3, 1). Received last week 32s. in unemployment benefit. Needs 32s. 1<sup>1</sup>*d.* Rent 8s. 6*d.* for two bedrooms and a kitchen. All other accommodation shared with two other families who live in the same house.

18. 3(3). *Below Poverty Line. Overcrowded.* Could not afford a higher rent.

Unemployed general labourer (39) with wife, two boys (11, 7), and four girls (9, 6, 2<sup>1</sup>*2* and 9 months). Unemployment benefit expired; receiving 35s. public assistance. Needs 40s. 9<sup>1</sup>*d.* Rent 4s. for one room in tenement containing five other families. Six families share one yard, water-tap and w.c.

19. 4(3). *Above Poverty Line. Overcrowded.* Could possibly afford a higher rent.

A ship's fireman of 46 with a wife, five sons (20, 16, 16, 14, 3) and two daughters (9, 5). Head unemployed for five weeks: in receipt of 32s. unemployment benefit

Eldest son a mill-hand, two sons of 16 both sell papers. One room sub-let for 2s. 6d. Total income last week 8os. Needs 58s. 4½d. Gross rent for whole house 7s. 4d. Family occupy two bedrooms, parlour, kitchen and scullery, but the parlour is also used as a bedroom. Garden, tap and one w.c. shared with sub-tenant.

20. 4(3). *Below Poverty Line. Overcrowded.* Could not afford a higher rent.

A woodcarver of 46 with a wife, a sister (49), a mother (76) and three sons (21, 17, 14). Head worked on his own account till his failure in 1928, since when he has been unemployed. The wife works as cleaner at a chemist's for 5s. Two eldest sons are a checker and an apprentice wire-worker respectively. Head's mother receives 10s. old age pension. Total income 59s. Needs 8os. 6d. Rent 8s. 1d. (restricted) for two bedrooms, kitchen and scullery.

#### DISCUSSION ON MR. CARADOG JONES'S PAPER.

MR. S. P. VIVIAN: It is with the greatest pleasure that I rise to propose the vote of thanks to Mr. Caradog Jones for his valuable paper. The contents and scope of the Merseyside Survey are very wide and cover many subjects of interest, and I feel sure the Society will agree that it is indebted to Mr. Caradog Jones for having, in this series of interesting papers, let us in on the ground floor to the material yielded by the Survey.

An examination of his paper provides some little matter only for criticism, but much for speculation. To myself, the particular interest of this paper is the light it throws upon the relation between overcrowding and poverty. This is summed up in Diagram 2 on page 233. We might perhaps have arrived by other means at the conclusion indicated there, that poverty accompanies casual employment and unemployment: but the particularly interesting feature of the diagram upon which I wish to comment is the frequent association of overcrowding with the Economic Classes 4 and 5, consisting of one adult male and other earners, whether those families are employed or unemployed, and irrespective, apparently—to some extent at any rate—of their financial position. This is a very interesting phenomenon, which gives rise to a certain amount of speculation. I should like to put to Mr. Jones some of the explanations which have occurred to me. In the first place, families of this type seem to me so composed that we have to beware of dealing with the aggregate income received by the family as though it were the effective income of the family as a whole. The chief earner would probably be responsible for the rent, and in the ordinary course he would levy contributions from the other earners present

in the household. But if we visualize what happens when the overcrowding becomes so irksome that the question arises of migration to more commodious premises, we can see that the person responsible for the rent will find it difficult to take upon himself responsibility for an increased rental owing to the precarious structure of the family itself and its lack of real homogeneity. The remaining earners are largely self-supporting economic units; there is always a prospect of their migration, and their future contributions cannot be relied upon. I suggest, therefore, that one element which keeps these families overcrowded, although their collective income would appear to be sufficient to pay for better accommodation, is that there is not, in fact, any effective command of an income sufficient to defray the cost of better accommodation and to stop the overcrowding. Then there are other grounds; in the first place these families, *i.e.* Economic Classes 4 and 5, are large families, and the Merseyside Housing formula puts up the standard against large families by requiring that they should have a living-room. For the larger family the standard is stiffer than for the smaller. Further, these types of family, owing to their composition, are difficult families to house. Those who have considered the subject of housing standards and the factors determining them will agree that the most intractable unit to house is the single adult. The easiest is the child, who can be housed without regard to sex separation, and does not take up so much room. The next most convenient unit is the married couple; and the family most easily housed is the natural family of a married couple with young children. But when there are a number of single adults, they require a disproportionate amount of accommodation: indeed, my experience is that, apart from the number of the family, the extent of its housing needs is entirely governed by the frequency of the occurrence of single adults. It seems to me that these families of Classes 4 and 5 are particularly of this character, and are therefore rendered by their composition more difficult to house. Of course that would not be a cause of overcrowding if the provision of housing accommodation were entirely fluid, and better accommodation could be obtained wherever the income was sufficient. But housing accommodation is not like a bar of soap, from which as much can be cut as is required. Houses are for the most part built in particular sizes: if in one locality houses of three rooms preponderate, a family of such size or composition as to require more than three rooms would be usually overcrowded; a family which can be satisfactorily housed in three rooms would not be overcrowded.

I feel sure that the type of family in these classes, *viz.* the family comprising a number of adult earners, is at the bottom of this extraordinary result that overcrowding in these cases has no relation to the financial position. I think that this type of family ought to be regarded as in the main abnormal. It is rather the consequence of overcrowding conditions than responsible in itself for the overcrowding conditions associated with it. The normal process of the break-up of families on their component units marrying or becoming economically independent has been checked by the shortage of houses. Young people who would normally set up house for them-



selves are obliged to live with their relations, and it is thus we get the type of families such as those referred to in Classes 4 and 5. It is not a natural type; it is precarious in structure and ready to break up. From the point of view of housing policy, I am not clear whether it is a type for which housing accommodation should be expressly made; it might be better to let such families break up than to facilitate their breaking up by providing the supplies of houses suitable for the more natural kinds of family units into which they will resolve themselves.

There are two points of enquiry that I should like to make; one arises on page 237 in connection with the figures as to social services. Mr. Jones points out, in reference to the contents of Table IX, that there is a relatively higher proportion of persons receiving benefit under the Health Insurance Acts in the most depressed class than in the classes which are more prosperous. He says: "Families may in the course of time become utterly poverty-stricken if the chief earners suffer continued ill-health." That, of course, is quite clear and right; but it is curious to find that, side by side with 34·8 per cent. of individuals in the lowest income grade of family who are in receipt of National Health Insurance benefits, there are 36·5 per cent. in families of the very highest grade above the Poverty Line. If Mr. Jones has an explanation of that, it would be interesting to hear it.

The one other point on which I should like to hear Mr. Caradog Jones further arises in relation to Table X on page 239, and the observations on page 241, with regard to the classes which, he says, represent the economic backbone of the population sampled. It may be that I fail to appreciate the real point, but the families in question are families 3(1), 4(1) and 5(1); that is to say, they are the regularly employed varieties of Economic Classes 3, 4 and 5; and the casually employed or unemployed variants of these classes are to be found in the adjacent columns. If you take into account the time element, is it not to be expected that some of the families in the Economic Classes 3, 4 and 5, which happened to be employed at the particular point of time at which this enumeration was taken, would be unemployed or less regularly employed at some other time? I am not quite clear in what sense it is the case that this group of families puts more into the social services and draws less out of them. It is natural to expect that in the case of social services so largely based upon insurance principles there will be at any time a larger proportion of persons paying in than drawing out; and I am not sure whether there is anything more in these figures than what one would naturally expect to find, viz. that the employed varieties of any types of families represent at any particular point of time the majority paying in, and that the unemployed and casually employed variety represent at the same point of time the minority drawing out.

At the close of this interesting paper—which is the last of a valuable series giving information of the results of the Merseyside Survey—I should like to turn to the general question of the form and character of these important local surveys or special investiga-

tions. Within recent years there have been two—the Merseyside Survey and the important London Survey. Apart from income figures, nothing obtained by either Survey is not obtainable from a Census with far greater completeness, certainty and detail. So far as a local special Survey may wish to confine its attention to a particular social class, we now have a Census classification by five social classes; and we hope to extend and improve this kind of classification. Even if it does not exactly fit the definition adopted by the Merseyside Survey, it is based on the same considerations, and accommodation is possible. So far as relates to figures of housing sufficiency, the Census is capable of producing such figures, according to whatever standard of housing sufficiency the local investigators choose to adopt; and in the matter of areas, if any particular grouping is required, that can always be arranged. Now both of these investigations have been planned and carried out during the intercensal interval. Apart from the great labour and expense involved in the independent collection of material, there are the difficulties referred to on page 228, due to the protracted period of enumeration under rapidly changing conditions; and I surmise that in some cases where the sample material has been utilized with particular refinements of combination, Mr. Jones may have found himself in some difficulty as to whether any differences between figures when compared were or were not, in view of the margin of error, significant. Ten years, however, is a very long time; and it is not surprising that the need or occasion for a special Survey of this sort should often arise at some distance from a Census. But I suggest that the adoption of a quinquennial Census series is putting a different complexion on the matter. The advantages of synchronizing these Surveys with a Census are so great that I should imagine that in future there should be very little doubt as to the proper course.

Reverting to the subject of income returns, it is difficult to prophesy; but in the case of a local investigation in which the need for some return about incomes arose, it is not impossible that Parliament would grant the necessary powers for such a Census enquiry if properly supported by representative local opinion. But even if it did not, it should not pass the wit of man to arrange to link up the results of any voluntary enquiry under this head with the Census results. It seems to me that the establishment of quinquennial Censuses has put a different complexion upon the prospects of such Surveys as the London and Merseyside Surveys in the future, and that it is at least an alternative policy worthy of consideration that they should take the form of special local expansions and supplementations of the basic Census material on pre-arranged lines. Mr. Caradog Jones has himself pointed out in his previous paper the fact that the Merseyside Survey has departed to some extent from the methods of the original Booth Survey by resorting to random sampling, and it seems to me that we may be in sight of a further development which may harness the whole Census machinery to such local Surveys in the future.

MR. A. R. BURNETT-HURST; I have much pleasure in seconding

the vote of thanks. The paper is of special interest to me in view of the fact that in 1913 and 1924 the Ratan Tata Foundation carried out certain studies in industrial centres, which the reader referred to as "The Five Towns Survey," and in those studies I had the pleasure of assisting Professor Bowley in the conduct of enquiries in four towns in 1913 and in one centre in 1924. The Merseyside Survey and similar investigations are to be welcomed if only because they confirm the general results of the earlier ones. I am glad that Mr. Jones has adopted the method of random sampling, for there are still some people who have not accepted it. Less than two years ago a distinguished member of this Society, while discussing the paper on the London Survey, referred to the random sampling method, as applied to social enquiries, as a haphazard investigation where the investigators had a genial conversation with the householder and came away with inaccurate information. For that reason it would have been a great advantage if Mr. Jones had devoted part of his paper to explaining fully the methods adopted, and how the difficulties were overcome. It is true that in the paper read to the Society in 1930 he explained the machinery to some extent; he told us that the investigators were School Attendance Visitors, and that the methods were largely similar to those employed in the Five Towns Survey, but we should like more information about two outstanding features—the family income and the Poverty Line. With regard to the family income, he tells us very little as to how the information was collected, what were the difficulties experienced, and how they were overcome. I think that if he had taken the Society into his confidence, there would be little risk of Fellows rising at subsequent meetings and challenging the methods employed.

This question of family income falls under two main heads—the section in which the data are rather difficult to procure, and the section in which information is easily and readily obtainable. In the first section we have the wages of individual members of the household, the money wages as well as payments in kind, food, clothing, uniform, rent allowance and so on, income from allotments, property and investments, and lodgers' payments—whether for board only or for board and lodging. All these items are very difficult to ascertain, and it is necessary to adopt certain methods of confirmation. On the other hand, items such as family income, unemployment benefit, health insurance benefit, old age and other pensions, come under the category of what can be easily ascertained. Apart from that, there is undisclosed income, possibly including gains from betting, gambling, and so forth, which as a rule is omitted in enquiries of this character.

Let us take the question of wages. One of the first difficulties experienced by an investigator is that when he knocks at the door and makes his enquiries, if the wife answers the door, she has to be approached in a particular way. He must make an appeal in the matter of housing conditions, and try to win her on his side; having done so, he tactfully approaches the subject of the earnings of the members of the family, and in many cases he will get the following

reply :—" My old man gives me so much." That does not mean that the amount stated constitutes the earnings of the husband. By calling at night the investigator will often find the " old man," who on being asked the question, carefully closes the door behind him and says, " Now look here. If you don't tell the old woman what I am telling you, I will give you the information," and he whispers that he gets so much and only gives his wife so much of it. That does not infrequently occur, but in many cases it is possible to follow up the information if the name of the employer is secured, and confidential enquiries from the employer will confirm the wage statement given. In fact, it is not necessary to ask for the wage figure, provided the name of the employer and the department in which the man works can be ascertained. In our enquiries we found, as a matter of fact, that on the whole, allowing for the wife's understatement, there was an extraordinary similarity between the statements of the employer and employee. I should very much like to know whether Mr. Jones has followed that method of checking wage statements?

Apart from persons in regular employment in the main industries, there is the difficulty of ascertaining the wages and incomes of persons engaged in peculiar occupations. One of the difficulties I had to face at Northampton was to find out the wage of a horse-slaughterer's cutter-up, and in the end it absolutely baffled me. There is also the case of hawking. I tried to get friendly with a number of hawkers with a view to obtaining information as to income, but these occupations present a great difficulty. Then there is the question of the assessment of clothing and uniform; and again, in the matter of allotments, it is not easy to ascertain the value of the produce of different plots. It would be rather interesting to hear from Mr. Jones how he met similar difficulties.

I notice in the paper that Mr. Jones refers to the number of houses where two or more families are under the same roof. When we enquired whether there was more than one family in a house, we invariably had the reply " lodgers." Lodgers sometimes made a payment for certain rooms of the house, but the difficulties were increased when board and lodging were given. We then tried to apportion the payment between rent, cost of food and remuneration for services rendered. No doubt in this particular survey Mr. Jones has faced these difficulties and overcome them, but it would be interesting to know how he dealt with them.

Table IV on p. 225 shows a considerable divergence between the figures for the Survey Poverty Line and Unemployment Benefit. For example, in the case of a family consisting of a man, wife, one infant and two school children, the Poverty Line stands at 37s. 7d. as against only 32s. for Unemployment Benefit. The Poverty Line for a similarly constituted family in some of the towns investigated in 1924 is as follows :—

	s. d.	
Northampton . . . . .	41	3
Bolton . . . . .	40	6
Warrington . . . . .	40	0

If due allowance is made for differences in the cost of living, it would appear that the Poverty Line in these towns more or less corresponds with that drawn for the Merseyside survey.

MR. HENRY CLAY wished to associate himself with the proposer and seconder of the vote of thanks to Mr. Caradog Jones. He immediately wished to show his gratitude in the traditional manner by asking for a little more information. Would Mr. Jones give the proportion of the total population represented by the classes to which the sample was confined, so that his percentage of wage-earners could be converted to a percentage of total population below the Poverty Line?

Again, on p. 223, at the end of the first paragraph, Mr. Jones said, "Had we been dealing with the general population, and had its birth-rate been falling at the same rate as between 1911 and 1921, the number of persons per family in 1929-30 in Merseyside would have been 4.27. Instead of that it is 4.18." It would seem that there was no reason for supposing that the birth-rate had continued to fall at the same rate as between 1911 and 1921, and it should be possible to make a composite birth-rate from the Medical Officers' reports. That would be interesting to compare with the rates of the sample.

Mr. Jones had referred to the coincidence of the Poverty Line of the enquiry for a family of man, wife and one infant, with the benefit paid under the unemployment scheme, and described the agreement as striking. It was striking, but for a different reason, because the unemployment scheme was not intended to afford a subsistence wage. That was stated in a paper by Sir H. Llewellyn Smith, which was a convenient summary of the principles on which the scheme was laid, and it was repeated in 1925 in a debate in the House of Commons by the then Minister of Labour. If, as a result of the twenty-three Acts which had been passed to amend the 1920 Unemployment Insurance Act, the benefit did provide a subsistence wage, there had been a change of principle in the insurance scheme which had come about without, so far as he could discover, anyone deciding to make that change, or being able to say who was responsible for it.

On p. 225 Mr. Jones referred to this "Poverty Line" as "the minimum income required by a family of given age and sex constitution in order to purchase the bare necessities of life." The fact that all the Poverty Lines seem to bear a close relation to the wage of unskilled labour in the country in which they are made makes one doubt the scientific value of the dietetic data on which the line is based. He (the speaker) always wondered how, if 27s. 7d. was necessary to purchase the bare necessities of life, and if, as has been calculated, real wages had increased fourfold in the nineteenth century, the population at the beginning of that century ever survived. The South African native miners, who were extraordinarily efficient at their job, and who achieved an output of coal about double that of the English coal-miner, contrived to do their work—and to put on weight—on an expenditure of 5d. a shift,

which was very different from the expenditure of the poorest European worker. For these reasons, he thought the Poverty Line should be used not as a scientifically determined minimum subsistence figure, but as a *datum* line, and he would like to call it the "Poverty Datum Line." It was useful to know that a certain proportion had less than a given income, and that another proportion had a higher income.

He had been much struck by the weight in the causation of poverty (as defined) attributed to unemployment, because one of the most striking results of the investigation to which Mr. Burnett-Hurst had referred was the small influence unemployment had in causing statistical poverty in the Five Towns investigation; he thought the difference between Merseyside and those five towns might perhaps be attributed simply to the difference in the state of trade, when 1929 was compared with 1913 or with 1924. It appeared from the tables that any payments received under the unemployment insurance scheme were included in the income taken into account for deciding whether the income was below the Poverty Line. It would be interesting to make an estimate of poverty excluding all forms of social income, and not merely the special form of Public Assistance.

In Table XI, less than half the families in the sample in which the chief wage-earner was unemployed were in receipt of unemployment benefit. It would be interesting to know what were the sources of income of the other 52½ per cent. of families suffering from unemployment.

MR. R. A ABABRELTON said that there were many cases now where persons in a family, well able to maintain themselves, were still managing, somehow or other, to obtain public assistance of some kind. He would like to ask Mr. Vivian whether it was possible to obtain, by means of a question in the next Census, information as to whether this public assistance was being obtained where it ought not to be obtained?

[Mr. Vivian, the Registrar-General, stated that the Census questions had been settled by Order in Council. It was too late now to make any additions.]

MR. WYATT said he would like to ask, in view of the fact that overcrowding and poverty were frequently not related to each other, whether increased accommodation was available? Also, was it possible in the investigation to find out whether rents were falling in relation to the fall in prices?

A MEMBER of the audience said that the paper was described as relating to 1929-30, but it would make a considerable difference to know whether the period included the first half of 1929 or the second half of 1930.

PROFESSOR GREENWOOD said he would like to ask Mr. Caradog Jones to clear up the question of method. Like Mr. Clay, he gathered from the paper that the method was that a certain random sample was taken, then a Poverty Line was drawn, and a count was made in

the sample of the proportion of families, and the income that they had, that fell below that line. This seemed to be confirmed by Table IX. He was then brought to a standstill by the equivocal passage on page 242: "In judging the amount of poverty discovered in our sample, it must be remembered that no account has been taken of any addition to family income in the form of public assistance, on the ground that such addition is presumably made only if it is deemed that the family (or individual) concerned would otherwise be destitute." What did that really mean? Taken separately it seemed to stultify some of the tables.

Professor Greenwood was in complete agreement with Mr. Clay on the importance of describing this Poverty Line as a datum line. With all respect for the accuracy with which these sampling Surveys had been made (he was unable to identify the "distinguished Fellow of the Society" who criticized the sampling method), the difficulty of obtaining complete information with respect to the sample was great; these data were not purely arbitrary, but there must be a character of arbitrariness about them. Take, for instance, the problem of determining the amount of food consumed by a family. He had had a good deal of experience, because nutrition surveys had been made under the auspices of the Medical Research Council with the objects of obtaining a full budget of family food. With the best will in the world on the part of the person supplying the information, it could not, he thought, be done by the method of these Surveys. Specially trained investigators using special methods were needed.

In future Surveys, considering the large number of families below the Poverty Line, it might be advisable to try to obtain some check from morbidity and mortality figures, because if these Survey results were taken, not at their face value, but a good deal below, much evidence *ought* to be found of chronic under-nutrition in the population. The health of communities as measured by mortality rates during the dreadful years at present being lived through showed no sign of deterioration.

THE PRESIDENT said he shared a good deal of Professor Greenwood's feeling, but approached from a different angle. The subsistence line was very necessary, but manifestly it was not a definite absolute, and in the light of recent experience it might be statistically absurd. If one went to a great authority like Professor Greenwood and asked him how many calories would keep the heart ticking or take one upstairs in low gear, he would give the answer, and with the same unimpeachable authority he would tell you the minimum number of cubic feet of fresh air necessary per person. Professor Bowley would then put these physical absolutes into figures of food, get a price and a wage figure, and we should then call that a "subsistence level." What was called a subsistence level was not absolute at all, but relative to one's own ideas.

It had been asked in the discussion how those families living long ago existed; they did not; they died. If one delved into the literature of Paley and his school, many illustrations would be found of things which he regarded as above subsistence level which to-day

were considered to be below it. The subsistence level changed and would continue to change, and there would always be a large number below it at any time. The most striking illustration of this was that of Australia in 1921, when a Commission was investigating this basic wage question, taking evidence from witnesses who worked the figure out in calories, and priced it. The figure came out to £5 16s. in Sydney and £5 12s. in Melbourne. It was sent to our old friend Knibbs and he replied by return of post that the basic charge in itself, without the differentials for skill and responsibility in excess of the lowest, would exhaust the whole national income of Australia. In these matters it was necessary to go the other way, and look at the total output of production; it was a mistake to let the public think such figures were statistical absolutes.

It would be interesting if Mr. Jones would add a note to the paper as to who gave the information—the wife or the husband. It was not at all easy to get accurate information. His own experience had not been very successful: he once tried to get a gardener, who had control of a garden producing sufficient to maintain several families, to give him some idea of what became of his produce, and the amount, with no success. His next attempt was in the case of a ferryman, who, when asked what was the average number of passengers he ferried over the river, replied that there was no average; sometimes there were a lot, and sometimes none. His mind was evidently going through a stage of great discomfort, and it was impossible to pin him down and get him to give any kind of figure, for he knew nothing of bimodal series!

The motion had been proposed and seconded, and he hoped the meeting would accord a very hearty vote of thanks to Mr. Caradog Jones for his interesting paper.

(The vote was then put to the meeting, and was carried unanimously.)

MR. CARADOG JONES in reply, said: I appreciate reading a paper before the Statistical Society because it is always followed by ample criticism, and such criticism is bound to be useful. In the past I have had the privilege of taking time to consider my replies to the various criticisms made, and I think it is better to do so again. I should like, however, to say a word on two rather important points that have been raised. First, in reply to the question asked by Professor Greenwood as to the method of calculating income: Under the head of "Income" the earnings of all the members of the family were included, together with income from any other known source, except any received in the form of public assistance, or poor relief, as it used to be called. That, I understand, is the basis adopted in the London Survey, and we are attempting in the Merseyside Survey to follow methods which will give results as far as possible comparable with the London results.

As to the question of the Poverty Line, I agree with Mr. Clay, Sir Josiah Stamp and other speakers as to the difficulty of determining a strictly scientific minimum standard of living, but I think



we can aim at such a standard, making the best use of knowledge that is available by approaching authorities like Professor Greenwood and others, as I have no doubt Professor Bowley and those engaged in defining the standards for the London Survey have done. Here again, in determining the Poverty Line, I wish to point out that Liverpool is adopting practically the same standard as London. I have described it as the minimum sum required to buy the necessities of life for a family of given age and sex constitution, meaning by necessities, rent, food, fuel, light, clothing, cleaning materials—allowing nothing for luxuries of any kind. It is possible, I suggest, to attempt to find what it actually costs to keep an adult male, say for a week, in food. We can take the best scientific evidence available on that question. Similarly, we can make an allowance for the cost of clothing when we know the people in the family that are to be clothed. It is on that kind of basis that a figure is obtained which is called the Poverty Line figure. We then follow the method that Professor Greenwood suggested—if the total family income is less than the Poverty Line figure, that family is included in the number below the Poverty Line. But in arriving at the total family income, as already explained, we did not include public assistance. I have pointed out that it may not seem altogether consistent to omit public assistance, that there may be income of other kinds that could be omitted on precisely the same grounds. In view of that possible criticism it may be of interest if I quote here a further calculation I have made. In the sample the proportion of families below the Poverty Line, according to the estimate recorded in the paper, was 16 per cent. The proportion of families in receipt of public assistance, I estimated at 7 per cent. Most of them were below the Poverty Line. If public assistance also is counted as income we shall then be taking in all the available income known, and 130 families would be raised above the Poverty Line that in the paper were placed below it. The result is that the percentage of families below the Poverty Line falls from 16 to 14. The difference is much less than might have been anticipated; and supposing the families in receipt of public assistance were given enough relief to raise them above the Poverty Line, I find that 10 per cent. of all the families sampled would still be below the Poverty Line.

I think I have now dealt with the two most urgent questions raised in the discussion and I will endeavour to answer other questions later. I should like, if I may, to take this opportunity of thanking the Council of the Statistical Society for giving the Merseyside Survey this further privilege of placing its results before the members.

The following contribution to the discussion was received from Mr. H. L. TRACHTENBERG after the meeting :—

Some of Mr. Jones's results are obvious, such as the fact which emerges from Table VI, that families with no earner supply a much larger percentage below the Poverty Line than families with one adult male in regular work. But it is nevertheless of value to have even obvious facts expressed in numbers; and Mr. Jones's tables also bring to light many valuable facts which are less obvious.

A Poverty Line drawn at the minimum income required to purchase the bare necessities of life is a tragic line indeed. It would be of interest to draw, in addition, a further Poverty Line in which the standard of living was raised to the extent that not only the bare necessities of life were included, but the ability to purchase some means of recreation without which life is mere slavery. Thus having three classes :—the pitiful class, represented by the one below the original Poverty Line; the next class, which, though poor, actually lives; and the comfortable class.

I support most heartily Mr. Vivian's plea for the use of Census material in such investigations as that undertaken by Mr. Jones. Overlapping is thus prevented and full use made of the great facilities afforded by the Registrar-General's Department, which Mr. Vivian had so generously offered to adapt in the matter of area selection.

Finally, I was struck by the statement of the seconder of the vote of thanks, that in order to obtain data it is necessary to get on the best side of the wife. I think it deplorable that any information should be obtained by methods which depend for their results on such psychological factors. Far better to live in economic ignorance than to obtain information depending on the approaching of husband and wife separately and the subsequent reconciliation of their divergent statements.

Regarding the sampling question, as a mathematician I support the principles underlying the use of the sample, but recognize the possibility of the realization of the rare chance that the sample may turn out to be of an extreme form, and thus give untrustworthy results.

The following addition to his remarks was sent in subsequently by Mr. CARADOG JONES :—

In discussing overcrowding among families which are relatively prosperous, Mr. Vivian has put his finger upon one explanation of it which I consider to be of special importance, namely, that the head of the family has not the spending of the whole income at his command. To this explanation prominence has been given in the first of a series of papers recording the results of the Survey in a form suited to that part of the public which is attracted by social problems but repelled by statistics ("Housing Conditions in Liverpool," 6½*d.*, to be obtained from the Secretary of the Merseyside Survey, 26, Abercromby Square, Liverpool). Mr. Vivian went on to remark that the Merseyside standard of accommodation is stiffened against large families by requiring that they should have a living-room. That surely is reasonable. It is unhealthy for persons to spend the night in a room which has been occupied throughout the day. The only question is—Where should the line be drawn between small families and large? I agree that families containing several adults are always difficult to house, but I do not think the difficulties they create can be removed by the simple process of saying that these are abnormal families and, under ordinary conditions, were it not for the shortage of houses, they would break up of themselves

when the young adults got married. That is only a statement of the problem : it is not a solution.

Turning to the figures in Table IX, I was asked for an explanation of the curious distribution relative to the Poverty Line of families containing individuals in receipt of health insurance benefits. If the head of a family falls ill, he being the only earner, sickness benefit may not succeed in lifting that family above the lowest income grade. If, however, the sick individual is an adult son or daughter, the father being in regular employment, the earnings of the latter together with health insurance benefit paid to the former may serve to keep the family in the top grade of income. Both these are fairly frequent types and they probably account for the distribution recorded.

A question was also raised as to whether in effect I had not been hammering at an open door in so emphatically saying that persons who are in regular employment pay for social services to support the unemployed and the casually employed. It is true, as I myself indeed pointed out in the first paragraph on p. 241, that some of those in regular employment to-day may be unemployed to-morrow. But a sample taken in 1926 of the Kew records of the first few years of full Unemployment Insurance disclosed the fact that all the benefit had been drawn by 52 per cent. of the workers : the remaining 48 per cent. had never drawn a penny. A later enquiry, also by sample, showed that over 2½ years 75 per cent. of the insured workers had claimed no benefit, and only one in 12 had been in receipt of benefit for long spells. I confess that to me these figures are amazing, and I am not sure whether we ought to be more astonished at the apathy or at the generosity of those workers in regular employment who contrive patiently to bear their part of the burden of an "Insurance" scheme which is so heavily weighted against them.

Mr. Burnett-Hurst, like the distinguished critic of the sampling method whom he wishes to convert, has, I fear, confused the issue in his contribution to the discussion. The results of our survey may be attacked on two grounds : (1) that the sampling method itself, judged as a mathematical instrument for securing statistical results, is a bad method ; (2) that the raw material collected is unsatisfactory. Both the original attack and the line of defence Mr. Burnett-Hurst invited me to take against a possible renewal of the attack were confined to the second ground. But any statistical method may lead to absurd results if the raw material is not trustworthy, and to condemn the sampling method on that ground, which is not peculiar to it, is clearly illogical.

No mathematician would question the value of the sampling method as a labour-saving machine, though all would admit that, as Mr. Trachtenberg points out, one must beware of the occurrence of the rare chance. If the sample is a large one, and if it has been really selected on the random principle, the risk of error is slight, but I myself would always advise caution in accepting a conclusion which seemed to conflict either with common sense or with other evidence. Anyone who doubts the adequacy and economy of random sampling for certain types of investigation should turn again to the writings

of Professor Bowley and the illuminating studies of Unemployment Insurance records by Mr. Hilton. The late Professor Edgeworth's Presidential Address to the Statistical Society also touches characteristically upon the same subject and can still be read with profit.

Passing now to the question of the collection of the raw material, it is, of course, vitally important to select as investigators people with tact and discrimination. We were fortunate in that our visitors were already well acquainted with many of the families they were asked to investigate. All those containing children of school age would be known to some of the school attendance officers, and the parents would think it not unnatural that they should be interested in the after-careers of the young people for whom they had been in part responsible in the past. It would not be difficult for them in general to ascertain the required particulars as to the occupations and earnings of all the members of the family. Sometimes the information would be given by the husband and sometimes they would be dependent upon the wife for it. Not infrequently it might happen, as Mr. Burnett-Hurst suggested, that the wife did not know the husband's earnings. But it must be remembered that these investigators were experienced men who, by the very nature of their every-day work, had acquired a high degree of skill in extracting the kind of information we required. Moreover, it was carefully impressed upon them that they were not to accept any unlikely statements without further enquiry. Assuming that the occupation and the number of days worked were known, if it were an occupation subject to standard rates, it was a simple matter to arrive at the earnings. There are comparatively few persons in occupations of so obscure a nature that it is quite impossible to estimate what they are paid. The most difficult class is perhaps that of the small shopkeeper whose profits vary from week to week, and who may not be able himself to tell you precisely what they average. Any payments made in kind which came to the knowledge of the investigators were assessed at their probable value. Lodgers living with the family were treated by us as members of the family. We at first tried to treat them as independent units, making allowances for their contribution to the family exchequer and for what they received in return, but we found this quite impracticable, owing to the lack of any standards of consumption and payment which could be accepted as applicable to the majority of cases. Our procedure can be justified on the ground that in these walks of life there is a wonderful camaraderie among people living under the same roof. Few lodgers of any long standing would, I believe, see the family in need of food without lending them a helping hand, and the lodger in turn would be assisted by the family. It may be added that every card as it came in to us was subjected to a most careful scrutiny, and further enquiry was at once made about any point in it which appeared to be incomplete or unsatisfactory in any way.

The ultimate test in any survey of this kind, of the raw material as well as of the methods used in its analysis, lies in the consistency or lack of consistency between the results obtained from different areas of the same general character. In some cases also it is possible

to check figures by others from quite independent sources. If the results for Liverpool, Birkenhead and Bootle are compared throughout this paper it will be found that there is in general as close an agreement between them as one would expect; Wallasey, an area more residential than the others, generally differs from them appreciably. Such independent checks as we have so far been able to apply have also satisfied us as to the reliability of the material.

Mr. Henry Clay asked if I would give the proportion of the Merseyside population represented by the classes sampled in our survey, his object being to get at the percentage of the total population below the Poverty Line. I can supply an estimate of the figure for which he asks, but I doubt if he can justifiably attain his object with it. We sampled 6,906 families, comprising a population of about 29,000. The majority of them gave particulars as to their income. Taking into account the size of the sample, and allowing for refusals, the population from which it was drawn represents roughly 70 per cent. of the population of Merseyside. It would not be unfair to assume that what is true of the random part is, within the limits of probable error, true of the whole of the class to which the sample was confined, but we cannot assume that it is also true of other classes. Among these other classes it is practically certain that there is less poverty, but it is unlikely that there is none. There is the further difficulty, to which I shall presently allude, that poverty cannot be interpreted in the same terms in different classes.

The purpose of the paragraph in the paper relating to the fall in the birth-rate, commented upon by the same speaker, was merely to draw attention to a subject of interest which we hope to explore further and which was left there with a passing reference because it was only incidental to our main discussion.

I should like to add a little to what I have already said about the Poverty Line. I suspect that the only difference between my view and that of Mr. Clay and others is one of description. If there is to be any attempt to estimate poverty, clearly poverty must first be defined. Moreover, the Poverty Line should not be a line chosen arbitrarily, as the use of the expression "datum line" might suggest: it should bear as close a relation as possible to facts. These facts, however, are not static. The standard adopted would, of course, vary from country to country, from time to time within the same country, and from class to class at the same time in the same country. The lines will be drawn at different levels according to the standard of living prevailing at different places, at different times, and in different classes. My contention is that it should be possible within any country, at a given period of time, for a selected class, to determine on scientific principles (though not with the precision one would wish) the minimum income required to purchase for a family of known type the bare necessities of life, if you have decided what is to be included under the head of necessities, that is, in other words, if you have defined their standard of living. The actual determination would take no account of the wages of unskilled labour, except indirectly, inasmuch as these wages are themselves necessarily related to the standard of living. The approach to the problem would be

from a different angle, and I think it is, therefore, a matter of interest when such an independent calculation gives a result closely agreeing with a benefit grant made to a family on some other grounds. Although the actual determination of a Poverty Line is not a simple problem, the conception is, I suggest, perfectly simple. Is it going to make it simpler to call it a "Poverty Datum Line" as Mr. Clay wishes? Would that not have the effect of making it sound to the plain man more mysterious than it really is? For him the addition of the word "datum" would be insufficient: for Mr. Clay, Professor Greenwood and Sir Josiah Stamp it is unnecessary.

Another question raised by Mr. Clay was as to the source of living of families suffering from unemployment but not in receipt of unemployment benefit. Quite frequently unemployed individuals are carried by other members of the family who are earning. When there are no earners in the family, public assistance usually comes to their relief. We took out figures for two or three districts in Liverpool concerning over 300 unemployed persons not in receipt of unemployment benefit. According to this evidence 94 per cent. were supported by one or other of these means with or without some form of social income. Over one-half of them were, in fact, wholly or partly, dependent upon the earnings of relatives, and a quarter were solely dependent upon such earnings. Over one-half, also, were wholly or partly dependent upon public assistance, and one-third were entirely dependent upon such relief.

The first of Mr. Wyatt's questions has been answered in a former paper: lack of available accommodation at a reasonable price in the neighbourhood where it is required is, I believe, one cause of the overcrowding discovered in our sample. The second question we have not explored.

At this point in the discussion an apparently unidentified voice desired to know the precise period covered by the survey. The answer will be found on p. 228.

I need not enlarge upon the reply I made to Professor Greenwood further than to point out that the data in this paper relate solely to the income side of the family account. Some readers might be apt to interpret his remarks as implying that our investigators, in calling from house to house, endeavoured to discover how much food each member of each family consumed, and that it was upon arbitrary evidence of this kind that the determination of the Poverty Line was based. If any doubt on that point still remains, perhaps I may be allowed to refer to *J.R.S.S.*, Vol. xciii, Part iv, pp. 563, 564, for further details.

I should like in conclusion to say that I appreciate the importance and, if I may say so, the significance of the remarks made by the Registrar-General at the close of his speech, as to the possibility in the future of closer co-operation between local bodies and the central Census Authority in any Surveys that are carried out. I share his hope that such co-operation may be possible, though I am inclined to doubt whether even a quinquennial Census will do away with the necessity for local Surveys, because some of the most interesting and valuable information we have been able to collect is quite out-

side the range likely to be contemplated in any official enquiry. If we agree as to the desirability of collecting such information, the further difficulty arises that, in order to correlate effectively local particulars—concerning, let us say, income—with such other local data—concerning, let us say, housing—as the Census Authority can supply, it would not suffice to work with general averages of each kind; it would be necessary to establish a one-to-one correspondence between the income and housing data for each individual family before proceeding to a determination of averages. I do not see how either body could overcome that difficulty without considerable labour and without infringing the confidential character of the information supplied.

My own feeling is that local surveys are likely to increase rather than diminish in importance. At present there is a vast accumulation of statistical and other records issued by different bodies which few people study and fewer still digest because it is nobody's business to co-ordinate them. It would be an immense boon if the country could be mapped out into a number of suitable regions, each with a statistical officer attached, whose function it would be to present periodical reports upon the social conditions and industrial development of his own area, supplementing existing data by special enquiries conducted on uniform lines so that the different regions might be effectively compared. There should, of course, be close collaboration with the Central and Local Authorities, and especially with the General Register Office, to prevent overlapping. We should then begin to see our problems not in isolation but as parts of an ordered whole, and we should approach them with less bewilderment.

As a result of the ballot taken during the meeting, the candidates named below were elected Fellows of the Society :—

Harold Victor Knight.  
Donald Mitchell Marvin.  
James Newton Paterson

Thomas Austin Potts.  
John R. H. Shaul.

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## WHOLESALE PRICES OF COMMODITIES IN 1930.

By THE EDITOR OF THE "STATIST."

(The *Statist's* Index-Numbers in continuation of Mr. A. SAUERBECK'S figures.)

THE following table of index-numbers compiled to the end of 1912 by the late Mr. Augustus Sauerbeck, and subsequently by the *Statist*, shows the course of wholesale prices of forty-five commodities during the last twenty-three years as compared with the standard period of eleven years, 1867-77, which in the aggregate is equivalent to the

*Summary of Index-Numbers. Groups of Articles, 1867-77 = 100.*

	Vegetable Food (Corn, etc.).	Animal Food (Meat, etc.).	Sugar, Coffee, and Tea.	Total Food.	Minerals.	Textiles.	Sundry Materials.	Total Materials.	Grand Total.	Silver.*	Wheat Harvest.†	Average Price of Consols.‡	Average Bank of England Rate.‡
1873.....	106	109	106	107	141	103	106	114	111	97.4	80	92½	Percent 4.750
1896.....	53	73	59	62	63	54	63	60	61	50.5	112	110¼	2.483
1907.....	69	88	48	72	107	77	78	86	80	49.6	113	84½	4.925
'08.....	70	89	48	72	89	62	73	74	73	40.1	108	86¼	3.013
'09.....	71	89	50	73	86	64	76	75	74	38.9	113	83½	3.083
'10.....	65	96	54	74	89	73	81	81	78	40.5	102	81½	3.725
'11.....	70	90	61	75	93	76	81	83	80	40.4	110	79½	3.467
1912.....	78	96	62	81	110	76	82	88	85	46.1	97	76½	3.776
'13.....	69	99	54	77	111	84	83	91	85	45.3	105	73½	4.771
'14.....	75	100	58	81	99	81	87	88	85	41.6	109	72½	4.038
'15.....	108	126	70	170	126	92	109	108	108	38.9	106	65½	5.000
'16.....	133	152	86	130	158	129	136	140	136	50.4	97	58¼	5.470
1917.....	177	192	113	169	172	192	174	179	175	65.8	102	54½	5.15
'18.....	168	207	130	174	192	222	202	206	192	76.4	111	56½	5.0
'19.....	179	213	147	185	220	228	219	222	206	85.3	98	54½	5.166
'20.....	227	263	198	234	295	262	244	264	251	76.1	96	47½	6.71
'21.....	143	218	83	158	181	140	145	153	155	48.1	118	47½	6.092
1922.....	107	184	82	130	142	134	124	132	131	51.6	105	56½	3.692
'23.....	98	162	101	122	155	140	117	134	129	49.4	105	57½	3.496
'24.....	119	158	105	130	158	170	120	146	139	50.7	107	56½	4.0
'25.....	118	162	89	128	154	165	119	143	136	52.5	114	56½	4.575
'26.....	108	150	88	119	154	133	114	131	126	47.1	99	54½	5.0
1927.....	108	138	83	114	141	131	118	129	122	42.8	109	54½	4.650
'28.....	107	142	78	114	123	136	117	124	120	44.0	109	55½	4.5
'29.....	99	146	72	110	126	122	111	119	115	40.2	114	54½	5.508
'30.....	77	142	54	96	112	84	97	97	97	29.0	99	56	3.4
Average 1904-13	68	91	53	73	95	74	76	81	77	44.1	106	82½	3.733
1890-99	61	80	63	68	71	56	66	64	66	55.8	103	103½	2.958
'78-87	79	95	76	84	73	71	81	76	79	82.1	97	99½	3.264
1918-27	109	90	151	111	128	105	106	112	111	98.0	—	—	3.692

\* Silver 60.84d. (see note on p. 273) per oz., being the parity of 1 gold to 15½ silver = 100.

† Wheat harvest in U.K. to 1895: 29 bushels = 100; from 1896: 30 bushels = 100.

‡ Average price of Consols and the average Bank of England rate of discount are actual figures, not index-numbers; Consols 3% to 1888, 2½% from 1889, 2½% from April, 1903.



average for the twenty-five years 1853-77 (see the *Journal*, 1886, pp. 592 and 648, and 1893, pp. 220 and 247). There are added corresponding data for 1896, the year of lowest prices, and for 1873, just after the Franco-Prussian War.

The all-commodities index-number for 1930 (based with a very few exceptions on the average of fifty-two weekly quotations for each commodity) is 97, showing a fall for the sixth consecutive year. The figure for 1930 is the lowest annual average recorded since 1914. It is 15·7 per cent. lower than the average for the preceding year, 61·4 per cent. lower than that for 1920, the year of highest prices, and 59 per cent. above that for 1896, the year of lowest prices.

The complete series of annual all-commodity index-numbers is shown below. The table records the Sauerbeck-*Statist* index-numbers from 1846, *i.e.* from the commencement of the calculations together with Jevons' figures adjusted to Sauerbeck's standard for the years 1809, 1810 and 1818.

*The Statist's Annual Index-Numbers (in continuation of Sauerbeck's figures).*

Year.	Average No.	Year.	Average No.	Year.	Average No.	Year.	Average No.	Year.	Average No.
1930	97	1912	85	1894	63	1876	95	1859	94
'29	115	'11	80	'93	68	'75	96	'58	91
'28	120	'10	78	'92	68	'74	102	'57	105
'27	122	1909	74	'91	72	'73	111	'56	101
'26	126	'08	73	'90	72	'72	109	'55	101
'25	136	'07	80	1889	72	'71	100	'54	102
'24	139	'06	77	'88	70	'70	96	'53	95
'23	129	'05	72	'87	68	1869	98	'52	78
'22	131	'04	70	'86	69	'68	99	'51	75
'21	155	'03	69	'85	72	'67	100	'50	77
'20	251	'02	69	'84	76	'66	102	1849	74
1919	206	'01	70	'83	82	'65	101	'48	78
'18	192	'00	75	'82	84	'64	105	'47	95
'17	175	1899	68	'81	85	'63	103	'46	89
'16	136	'98	64	'80	88	'62	101	'18	159*
'15	108	'97	62	1879	83	'61	98	'10	171*
'14	85	'96	61	'78	87	'60	99	'09	189*
'13	85	'95	62	'77	94				

\* Jevons' numbers adjusted.

When, a year ago, the trend of commodity prices in 1929 was analysed in this *Journal*, reference was made to the fact that the purchasing power of sterling as reflected in the index-number was by the end of the year approaching once again its average for 1867-77, the eleven years which Sauerbeck chose as the basic period for his compilations; and it was pointed out that in view of the momentum imparted to the downward movement in prices by the financial

events of the year, the index-number of 100 which had occurred in the years 1855, 1863, 1867, 1871 and 1915 was likely to be seen once more in 1930. Less than five months sufficed for this prediction to be fulfilled, and by the end of May the index-number had receded to 98.8. The momentum behind the downward movement in prices was, however, such that the index-number did not stop in the neighbourhood of parity, but continued its fall, having as an apparent objective the level which obtained on average during the last pre-war year. The average index-number for 1913 was 85, and by the end of 1930 the index-number was within 2.2 per cent. of this figure. The margin has been still further narrowed by the continuance of the fall in prices during the current year. Without entering into any discussion of the causes of the slump in prices, it is permissible to draw attention to the fact that just as the abandonment of the gold standard over the greater part of the world accompanied the depreciation in the purchasing power of gold (as expressed in wholesale prices), which culminated in 1920, so the gradual return to the gold standard has coincided with the return of that purchasing power to the point from which the depreciation began in 1914. Viewed in this light, the great price movements which have occurred over the past sixteen years appear to be the natural corollary of fundamental changes in the monetary factor. Still keeping at a safe distance from the familiar controversy of deflation *versus* over-production, it is possible to add that given the conditions in which the gold standard has been restored, the level of wholesale prices might reasonably be expected to recover somewhat from the low point to which it has now fallen and to settle down at a figure somewhat higher than the average for the pre-war year. This assumption is based on the following grounds: (1) the greater economy in the utilization of monetary gold, especially through the withdrawals of gold from circulation and through the extension since the war of the gold exchange standard principle; (2) the justifiable hope that, with the return of confidence and the resumption of foreign lending on an appreciable scale by the U.S.A. and France, the present unequal distribution of gold reserves may to some extent be remedied; (3) the confident assumption that some at least of the suggestions made by the League of Nation's "Gold Delegation" will be put into practice, and that in consequence we shall in the future see a greater measure of elasticity in central banks' conceptions of what is a safe ratio between their total sight liabilities and their gold reserves.

The fall in prices during 1930 was uninterrupted, such seasonal influences as may in certain months have been making for a recovery being consistently overborne by other influences of a more fundamental character. In July the pace of the decline slackened, but

1818-1827 = 111	1896-1905 = 68	1910-1919 = 123
'28-'37 = 93	'97-'06 = 70	'11-'20 = 146
'38-'47 = 93	'98-'07 = 71	'12-'21 = 148
'48-'57 = 89	'99-'08 = 72	'13-'22 = 153
'58-'67 = 99	1900-'09 = 73	'14-'23 = 157
'68-'77 = 100	'01-'10 = 73	'15-'24 = 162
'78-'87 = 79	'02-'11 = 74	'16-'25 = 165
'88-'97 = 67	'03-'12 = 76	'17-'26 = 164
'90-'99 = 66	'04-'13 = 77	'18-'27 = 159
'91-1900 = 66	'05-'14 = 79	'19-'28 = 152
'92-'01 = 66	'06-'15 = 82	'20-'29 = 142
'93-'02 = 66	'07-'16 = 88	'21-'30 = 127
'94-'03 = 66	'08-'17 = 98	
'95-'04 = 67	'09-'18 = 110	

this was largely due to a recovery of seasonal character in the vegetable foods group. Thereafter the downward movement of the index-number resumed its former momentum, and it was only during the second month of the year 1931 that definite signs of an end to the slump in prices became observable. The fall in the index-numbers over the year 1930 measured 20·1 per cent. The sectional index-number for food-stuffs fell by 16·5 per cent., that for materials by 22·6 per cent. It is interesting to note that the disparity in the fall of these two sectional index-numbers has brought them very near equilibrium in relation to their position in the basic period 1867-77. Thus, the latest index-number calculated at the time of writing, namely, that for the end of February 1931, is 85·5, made up of sectional index-numbers of 85·1 for food-stuffs and of 85·7 for materials. Such disparity as may have obtained last year in the fall in various groups of sterling wholesale prices should not obscure the fact that the fall was general in character, each of the six sub-sections of commodities being on balance appreciably lower at the end of 1930 than at the end of 1929. This fact constitutes one of the main arguments in favour of those who see in the slump of prices that has recently occurred not the outcome of over-production in certain directions, but the resultant of one factor of monetary character operating equally along the whole line of commodity prices.

The fall in vegetable food-stuffs amounted on balance to 22·8 per cent. The quotation for English wheat fell from 9s. 6d. to 6s. 1d. per cwt., that for American wheat from 52s. 9d. to 25s. 6d. per quarter. The price of flour fell from 41s. to 25s. per sack. The only quotation in this group to show an advance was that for English potatoes, which at the end of the year stood at 115s. per ton as against 90s. per ton at the end of 1929. The fall in the prices of animal food-stuffs was less pronounced than in other groups of prices, amounting to 11·9 per cent. only for the year. The downward pressure in this group came from pork, bacon and butter. Beef and mutton prices, on the contrary, showed remarkable resistance to the influences making for lower prices, and, as will be seen from the

## January, 1928—February, 1931.

	Vegetable Food.	Animal Food.	Sugar, Tea, and Coffee.	Food-stuffs.	Minerals.	Textiles.	Sundry Materials.	Materials.	All Commodities
1928.									
Jan. ...	105.6	136.9	80.1	111.8	126.1	135.7	122.8	127.6	120.9
Feb. ...	107.3	144.2	79.4	115.0	121.3	137.7	119.3	125.5	121.1
March ...	113.8	150.2	81.4	120.4	123.4	136.7	119.7	125.9	123.6
April ...	118.5	151.2	80.7	122.6	124.5	139.6	121.2	127.8	125.6
May ...	120.9	157.5	82.4	126.3	124.6	139.6	117.2	126.1	126.2
June ...	114.6	147.3	80.2	119.4	119.6	142.7	115.4	124.9	122.6
July ...	105.6	145.1	78.2	114.4	119.8	140.3	116.3	124.7	120.3
Aug. ...	100.7	140.9	78.1	110.7	120.2	135.7	116.3	123.8	118.0
Sept. ...	96.9	139.9	77.3	108.6	123.1	129.8	117.5	122.8	116.8
Oct. ...	102.1	134.2	77.5	108.7	125.5	130.3	115.4	122.7	116.8
Nov. ...	102.5	138.0	76.1	110.9	126.7	131.9	115.9	123.7	117.9
Dec. ...	101.2	142.1	75.2	108.8	125.7	132.4	114.5	123.0	117.9
1929.									
Jan. ...	102.2	138.4	75.7	109.9	127.0	130.1	113.2	122.1	117.0
Feb. ...	104.6	145.1	75.4	113.4	129.8	131.2	117.7	125.1	120.1
March ...	101.8	144.6	75.2	112.0	133.9	130.9	118.9	126.6	120.5
April ...	97.2	149.2	74.5	111.6	125.7	123.8	113.7	120.0	116.5
May ...	91.0	145.6	72.3	107.2	124.0	120.1	111.1	117.4	113.0
June ...	90.3	150.1	72.7	108.6	125.3	119.7	108.4	116.4	113.1
July ...	103.4	144.7	72.1	112.0	126.1	117.2	112.2	117.5	115.2
Aug. ...	100.1	143.9	70.7	110.0	127.3	116.8	109.8	116.6	113.9
Sept. ...	96.3	141.6	72.3	107.9	127.2	112.7	111.3	116.0	112.6
Oct. ...	94.8	144.2	66.7	107.1	124.4	109.7	110.7	114.1	111.1
Nov. ...	89.8	142.6	64.4	103.9	121.6	106.9	108.3	111.5	108.3
Dec. ...	89.2	148.8	61.5	105.3	122.6	107.2	107.0	111.2	108.8
1930.									
Jan. ...	85.7	151.7	60.4	104.7	123.7	98.3	105.2	108.1	106.6
Feb. ...	79.3	156.0	57.5	102.9	120.7	96.5	104.0	106.2	104.8
March ...	77.3	148.5	56.9	99.2	118.8	94.4	105.5	105.7	103.0
April ...	78.7	149.5	57.2	100.3	112.2	94.2	102.4	102.5	101.5
May ...	76.4	138.5	56.3	95.1	111.1	94.6	100.4	101.5	98.8
June ...	75.0	139.2	53.0	94.0	109.1	88.3	95.8	97.1	95.8
July ...	78.4	135.2	49.8	93.3	110.0	82.5	94.9	95.2	94.4
Aug. ...	78.5	128.7	47.6	90.5	109.5	76.5	95.3	93.4	92.2
Sept. ...	75.3	132.4	48.3	90.7	107.4	73.0	93.6	91.0	90.8
Oct. ...	74.5	131.4	52.6	90.9	105.3	72.7	92.9	90.0	90.4
Nov. ...	72.3	127.4	51.6	88.2	105.9	70.2	91.6	88.9	88.6
Dec. ...	68.8	131.1	50.8	87.9	105.0	63.9	90.3	86.1	86.9
1931.									
Jan. ...	68.1	131.5	50.6	87.8	102.8	61.2	89.1	84.2	85.7
Feb. ...	69.0	124.3	48.6	85.1	104.6	62.8	90.4	85.7	85.5

detailed tables accompanying this article, the average value of these two commodities was higher in 1930 than in 1929. In the groceries group there was a net fall in prices of 17.4 per cent. The falls in sugar and coffee quotations were substantial, but until February of the current year, tea prices showed considerable resistance to the general downward trend. The sectional index-number for minerals fell by 14.4 per cent. over the year. Non-ferrous metals provided

the main contribution to this movement, the quotation for standard copper falling from £71½ to £46¼ per ton, that for tin from £183 to £115 per ton, and that for lead from £22½ to £16⅞ per ton. The textiles group with a fall of 40·4 per cent. has provided the principal contribution to the lowering of the general index-number. Every single commodity in this section is lower on balance, the principal falls being those recorded for cotton, wool and flax. In the sundry materials group, the index-number for which is 15·6 per cent. lower over the year, the principal movements have been the falls in the quotations for hides, tallow, palm and olive oils and seeds. Timber, petroleum and nitrate prices have shown considerable resistance to the downward movement.

*Silver.*—The year 1930 was marked by a continuation of the fall in silver prices, and closed with a spot quotation of 141<sup>7</sup>/<sub>16</sub>d. per ounce, which until then constituted a low record in the history of the silver market. The fall in the price of silver must to some extent be regarded as a corollary of the appreciation of gold in terms of all

*World's Production of Silver (in millions of ounces).*

	United States.	Mexico.	Canada.	Australia.	Other Countries.	Total.
1901...	55·2	57·6	5·2	10·2	44·8	173·0
'02...	55·5	60·2	4·3	8·0	34·8	162·8
'03...	54·3	70·5	3·1	9·7	30·1	167·7
'04...	57·7	60·8	3·7	14·5	27·5	164·2
'05...	56·1	65·0	5·9	15·0	30·3	172·3
'06...	56·5	55·2	8·5	14·2	30·6	165·0
'07...	56·5	61·0	12·8	19·0	34·8	184·2
'08...	52·4	73·6	22·1	17·2	37·8	203·1
'09...	54·7	73·9	27·5	16·3	39·7	212·1
'10...	57·1	71·4	32·9	21·5	38·8	221·7
'11...	60·4	79·0	32·7	16·6	37·5	226·2
'12...	63·8	74·6	31·6	18·1	36·2	224·3
'13...	66·8	70·7	31·5	3·5	51·4	223·0
'14...	72·4	27·5	28·4	3·6	36·5	168·4
'15...	74·9	39·5	28·4	4·1	37·3	184·2
'16...	74·4	38·2	25·4	4·2	26·6	168·8
'17...	71·7	35·0	22·2	10·0	35·3	174·2
'18...	67·8	62·5	21·2	10·0	35·9	197·4
'19...	56·7	62·7	15·7	7·4	32·0	174·5
'20...	55·5	66·8	12·6	7·5	33·0	175·4
'21...	53·1	64·5	13·1	4·9	35·7	171·3
'22...	56·2	81·1	18·6	11·3	46·3	213·5
'23...	73·3	90·9	17·8	10·3	50·2	242·5
'24...	65·3	91·5	19·7	10·8	52·2	239·5
'25...	66·1	92·9	20·2	11·1	54·8	245·1
'26...	62·7	98·3	22·4	11·2	59·0	253·6
'27...	60·4	104·6	22·7	9·0	57·3	254·0
'28...	58·4	108·5	21·9	9·0	59·5	257·3
'29...	61·2	108·7	23·1	10·0	58·7	261·7
'30*	51·0	106·0	26·0	8·0	53·0	244·0

\* Provisional.

other commodities, and has gone hand in hand with an equally severe depreciation in the price of a number of non-ferrous metals. Several factors in the statistical position of this metal also help to explain its rapid depreciation. They are: (1) the reduction in the demand for silver and other currency owing to the fall in prices; (2) the demonetization of silver coins and the sale of the bullion in the open market; (3) the inability of silver production to adjust itself readily to a fall in the value of the metal owing to the fact that silver is produced in large quantities as a bye-product in the manufacture of baser metals. Comparative statistics of world production of silver are appended.

The prices and index-numbers are as follows (60·84*d.*\* per standard oz., being parity of 1 gold to 15½ silver = 100):—

	Price per oz. standard.	Index- number.		Price per oz. standard.	Index- number.
Average 1873 ...	59½	=97·4	<i>Lowest</i> Nov., 1902	21½	=35·6
" '90-99...	34	=55·8	End Dec., 1906 ...	32½	=53·1
" 1917-26...	40½	=66·6	" Dec., '08 ...	23½	=38·1
" 1893 ...	35½	=58·6	" Dec., '11 ...	25½	=41·2
" '96 ...	30½	=50·5	" Dec., '12 ...	29	=47·7
" 1909 ...	23½	=38·9	" Dec., '13 ...	26½	=43·7
" '13 ...	27½	=45·3	" June, '14 ...	26	=42·7
" '14 ...	25½	=41·6	" Dec., '14 ...	22½	=37·3
" '15 ...	23½	=38·9	" Dec., '15 ...	26½	=43·1
" '16 ...	31½	=50·4	" Dec., '16 ...	36½	=58·7
" '17 ...	40½	=65·8	" Dec., '17 ...	43½	=70·0
" '18 ...	47½	=76·4	" Dec., '18 ...	48½	=77·9
" '19 ...	57	=85·3	" Dec., '19 ...	77½	=98·3
" '20 ...	61½	=76·1	" Dec., '20 ...	40½	=49·2
" '21 ...	36½	=48·1	" Dec., '21 ...	34½	=49·3
" '22 ...	34½	=51·6	" Dec., '22 ...	31½	=49·6
" '23 ...	31½	=49·4	" Dec., '23 ...	33½	=49·0
" '24 ...	34	=50·7	" Dec., '24 ...	31½	=50·4
" '25 ...	32½	=52·5	" Dec., '25 ...	31½	=52·1
" '26 ...	28½	=47·1	" Dec., '26 ...	25	=41·1
" '27 ...	26½	=42·8	" Dec., '27 ...	26½	=43·6
" '28 ...	26½	=44·0	" Dec., '28 ...	26½	=43·3
			" Dec., '29 ...	21½	=35·2
			" Dec., '30 ...	14½	=23·7

\* All the index-numbers in the table from 1916 to 1925 inclusive are calculated on the basis of the gold prices of silver instead of the sterling prices, though the latter are, of course, the actual price quotations given in the table. In arriving at the index-numbers the price of gold during 1916, 1917, and 1918 is taken as 86*s.* 9½*d.* per fine oz., derived from the "pegged" New York rate of \$4·76½ to the £. For 1919 the average price of gold is taken as 93*s.* 4½*d.*, this being the parity price with the U.S. dollar, the average New York exchange in that year being \$4·429. The index-numbers for other dates are based on the quotations in the London market for exportable gold. The average price in 1920 was 112*s.* 11½*d.* per fine oz., in 1921 107*s.* 0½*d.*, in 1922 93*s.* 4*d.*, in 1923 90*s.* 3*d.*, in 1924 93*s.* 8½*d.*, and in 1925 85*s.* 5½*d.* At the end of 1919 the quotation was 109*s.* 8½*d.*, at the end of 1920 116*s.* 1*d.*, at the end of 1921 98*s.* 0*d.*, at the end of 1922 88*s.* 11*d.*, at the end of 1923 95*s.* 4*d.*, and at the end of 1924 88*s.* 2*d.*

*Gold.*—The following table shows the world's annual gold production since 1850. Prior to 1911 the estimates are those of the Bureau of the U.S. Mint and other authorities. For years after 1911 the *Statist's* estimates are given. The value is taken throughout at £4.25 per fine oz. The estimate for 1930 is subject to revision.

(000's omitted.)

Year.	Value of output. £	Year.	Value of output. £
1850 ... ..	11,600	1891 ... ..	26,846
'51 ... ..	17,200	'92 ... ..	30,134
'52 ... ..	26,550	'93 ... ..	32,363
'53 ... ..	31,090	'94 ... ..	37,229
'54 ... ..	25,490	'95 ... ..	40,843
'55 ... ..	27,015	'96 ... ..	41,559
'56 ... ..	29,520	'97 ... ..	48,509
'57 ... ..	26,655	'98 ... ..	58,949
'58 ... ..	24,930	'99 ... ..	63,027
'59 ... ..	24,970	1900 ... ..	52,312
'60 ... ..	23,850	'01 ... ..	53,630
'61 ... ..	22,760	'02 ... ..	60,975
'62 ... ..	21,550	'03 ... ..	67,337
'63 ... ..	21,390	'04 ... ..	71,380
'64 ... ..	22,600	'05 ... ..	78,143
'65 ... ..	24,040	'06 ... ..	82,707
'66 ... ..	24,220	'07 ... ..	84,857
'67 ... ..	22,805	'08 ... ..	90,995
'68 ... ..	21,945	'09 ... ..	93,302
'69 ... ..	21,245	'10 ... ..	93,544
'70 ... ..	21,370	'11 ... ..	94,930
'71 ... ..	25,400	'12 ... ..	95,783
'72 ... ..	24,200	'13 ... ..	97,481
'73 ... ..	23,600	'14 ... ..	92,709
'74 ... ..	22,950	'15 ... ..	97,114
'75 ... ..	22,700	'16 ... ..	92,597
'76 ... ..	22,540	'17 ... ..	87,236
'77 ... ..	23,830	'18 ... ..	78,605
'78 ... ..	22,020	'19 ... ..	73,078
'79 ... ..	21,400	'20 ... ..	68,522
'80 ... ..	22,130	'21 ... ..	67,848
'81 ... ..	21,150	'22 ... ..	66,723
'82 ... ..	20,500	'23 ... ..	77,888
'83 ... ..	20,640	'24 ... ..	81,807
'84 ... ..	20,830	'25 ... ..	82,267
'85 ... ..	21,250	'26 ... ..	82,211
'86 ... ..	21,430	'27 ... ..	82,582
'87 ... ..	21,735	'28 ... ..	83,961
'88 ... ..	22,644	'29 ... ..	82,862
'89 ... ..	25,375	'30 ... ..	85,400
'90 ... ..	24,421		

The monthly (end of month) all-commodities index-numbers since 1885, together with quarterly averages for the group and final index-numbers since 1915 inclusive, are shown in the following pages.

Monthly Fluctuations of the Index-Numbers\* of 45 Commodities, 1867-77 = 100.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1885	72.3	72.6	72.5	72.5	73.3	72.7	72.2	72.2	71.1	70.4	71.1	70.8	72
'86	70.0	70.5	70.1	69.2	69.1	68.7	68.8	69.1	68.9	68.8	69.8	69.5	69
'87	69.5	68.5	68.3	68.4	68.2	67.9	68.1	68.3	68.2	67.7	69.1	72.4	68
'88	70.9	70.6	69.9	69.8	68.1	67.4	69.0	70.1	71.9	72.4	72.7	73.2	70
1889	72.6	73.5	72.1	72.0	71.4	71.6	72.6	71.4	72.1	72.1	73.7	73.7	72
'90	73.2	72.7	71.5	71.2	70.8	70.5	71.2	72.8	72.2	72.9	71.2	71.1	72
'91	71.1	71.5	71.7	72.4	72.8	71.8	71.6	71.9	71.7	70.7	71.4	71.4	72
'92	70.0	70.0	69.1	68.9	68.8	67.7	67.8	67.4	66.8	67.4	68.2	67.7	68
'93	68.4	69.0	68.1	67.4	67.4	67.4	67.7	67.1	68.2	68.6	67.8	67.0	68
1894	65.8	65.0	64.3	63.8	63.1	63.1	62.6	63.0	62.7	61.7	60.8	60.1	63
'95	60.0	60.0	60.8	61.7	62.5	62.4	62.8	63.3	63.5	63.3	62.3	61.2	62
'96	61.4	61.4	60.7	60.3	60.1	59.3	59.2	59.7	61.2	62.6	62.6	62.0	61
'97	62.0	61.9	61.9	61.5	61.2	61.3	61.7	63.2	63.4	62.7	62.4	62.4	62
'98	62.8	63.4	63.0	65.5	66.4	64.7	64.3	64.0	63.9	63.6	63.9	63.8	64
1899	65.4	65.8	65.6	66.1	66.6	66.9	67.9	68.3	70.0	71.5	71.6	72.3	68
1900	74.0	75.1	75.7	75.6	75.5	75.7	76.2	76.0	75.5	74.7	73.9	73.4	75
'01	72.2	71.7	71.0	70.6	70.5	69.8	69.5	69.8	69.6	69.6	69.0	68.4	70
'02	68.8	68.9	69.2	69.7	70.9	70.4	70.0	69.5	69.3	68.8	68.6	69.1	69
'03	69.5	70.2	70.4	69.4	69.6	69.5	69.5	70.0	69.1	69.0	69.0	70.0	69
1904	70.4	70.8	70.8	70.5	69.9	69.4	69.9	70.4	70.7	71.0	71.2	70.9	70
'05	71.2	71.4	71.8	72.0	71.7	72.0	72.5	72.3	72.4	73.2	74.2	74.9	72
'06	75.2	75.0	75.7	76.5	77.0	76.9	76.4	76.7	77.5	78.5	78.6	79.7	77
'07	80.0	80.7	80.0	80.7	82.4	82.0	81.1	79.4	79.1	78.8	76.7	76.2	80
'08	76.0	74.5	74.1	73.8	73.6	72.9	73.1	72.2	72.5	72.2	72.2	72.3	73
1909	72.0	71.9	72.4	74.3	75.4	75.1	75.2	74.9	74.7	75.2	75.5	76.3	74
'10	77.1	78.1	79.1	78.5	78.2	76.9	78.1	78.2	77.6	77.2	77.8	77.9	78
'11	78.5	78.6	78.9	80.0	80.3	80.0	78.9	79.5	80.3	80.7	80.6	80.9	80
'12	81.8	82.9	84.4	85.0	85.3	85.5	86.5	85.9	86.7	85.8	85.3	86.4	85
'13	86.4	86.4	86.7	86.2	85.7	84.1	84.2	85.0	85.7	84.5	83.3	83.8	85
1914	83.5	83.8	82.8	82.3	82.3	81.2	82.4	87.9	89.3	89.8	88.8	91.6	85
'15	96.4	100.9	103.7	105.9	107.2	106.4	106.4	107.0	107.8	110.0	113.1	118.4	108
'16	123.6	127.0	130.4	134.2	135.4	131.0	130.5	134.5	134.4	141.5	150.8	154.3	136
'17	159.3	164.0	169.0	173.0	175.0	180.4	176.9	175.7	176.4	180.6	182.9	185.1	175
'18	186.2	187.3	188.0	189.8	191.1	192.3	192.9	195.9	197.1	197.8	195.3	196.0	192
1919	190.1	187.7	184.7	184.6	194.6	199.4	206.4	212.7	214.8	224.3	231.0	235.2	206
'20	245.3	260.4	261.8	266.1	260.0	255.7	254.6	253.5	248.7	239.9	223.8	207.2	251
'21	197.2	183.0	177.2	169.8	162.2	155.8	158.2	154.3	149.4	138.4	136.7	133.6	155
'22	132.5	132.2	133.3	134.8	135.5	135.6	134.0	129.6	127.9	130.1	130.6	129.1	131
'23	130.2	131.9	132.7	134.0	132.2	127.9	124.8	125.0	127.8	127.7	132.4	133.2	129
1924	137.2	138.8	137.0	136.8	136.4	136.3	138.4	138.0	141.6	146.1	145.5	147.7	139
'25	144.8	143.1	140.1	137.5	135.7	131.2	134.3	134.3	132.7	130.2	132.9	130.4	136
'26	129.3	127.9	126.1	125.5	125.7	124.9	126.0	127.0	128.0	131.0	130.8	123.9	126
'27	123.1	124.1	123.6	123.3	123.8	123.1	122.0	122.8	121.5	120.6	121.5	121.4	122
'28	120.9	121.1	123.6	125.6	126.2	122.6	120.3	118.0	116.8	116.8	117.9	117.9	120
'29	117.0	120.1	120.5	116.5	113.0	113.1	115.2	113.9	112.6	111.1	108.3	108.8	115
'30	106.6	104.8	103.0	101.5	98.8	95.8	94.4	92.2	90.8	90.4	88.6	86.9	97
'31	85.7	85.5											

\* The average of the twelve monthly figures of each year does not necessarily coincide with the annual figures, as the latter are calculated mostly from the average of 52 weekly quotations, while the former are based on end-of-the-month prices.



## Quarterly Movements of Prices.\*

Summary of Index-Numbers, 1867-77 = 100.

Years.	Quar- ters.	Vege- table Food (Corn, etc.).	Animal Food (Meat, etc.).	Sugar, Coffee, and Tea.	Total Food.	Mine- rals.	Tex- tiles.	Sundry Mate- rials.	Total Mate- rials.	Grand Total.	Sil- ver.†
'19	I	171.2	216.6	121.6	177.4	173.1	202.5	201.2	194.0	188.1	77.3
	II	169.9	206.4	126.5	175.3	189.0	210.5	214.1	206.5	192.8	81.1
	III	178.0	207.1	165.5	183.7	226.1	228.9	234.9	230.7	211.3	84.2
	IV	184.3	226.6	177.6	198.2	251.5	270.1	242.6	253.4	230.1	95.7
'20	I	211.4	234.0	207.9	219.0	289.8	298.2	267.0	282.7	255.7	96.7
	II	244.5	250.1	243.0	246.3	296.3	271.8	254.5	271.1	260.6	79.2
	III	226.7	287.2	207.6	245.0	309.4	247.3	232.2	257.7	252.3	71.5
	IV	208.2	280.4	126.4	217.7	293.0	190.0	214.2	227.7	223.6	57.6
'21	I	151.4	270.6	100.1	184.5	222.6	153.5	187.9	186.7	185.8	46.8
	II	150.3	225.2	89.2	164.8	187.9	140.1	169.0	160.9	162.6	45.5
	III	149.8	202.5	81.4	155.3	174.3	142.7	147.6	153.4	154.0	48.0
	IV	118.3	166.9	78.3	127.8	149.6	150.0	132.3	142.4	136.2	52.4
'22	I	114.0	177.0	75.9	129.2	132.2	142.4	131.8	135.2	132.7	49.7
	II	116.0	199.5	80.3	139.2	134.7	136.0	128.3	132.4	135.3	52.9
	III	102.4	182.8	82.8	127.9	138.3	139.7	123.3	132.2	130.5	53.2
	IV	98.7	176.0	87.6	124.9	141.1	145.1	120.7	133.7	129.9	50.3
'23	I	94.0	175.3	100.6	125.3	154.4	139.4	122.2	136.2	131.6	50.1
	II	96.1	164.0	110.2	124.0	156.6	141.9	120.3	136.6	131.4	50.5
	III	100.3	167.7	96.2	120.6	149.0	134.8	113.9	129.7	125.9	48.2
	IV	101.1	152.0	105.1	120.7	158.9	153.5	115.0	138.7	131.1	48.8
'24	I	115.1	146.2	111.5	126.6	169.0	159.6	121.0	145.9	137.7	48.8
	II	118.3	155.3	97.2	127.5	156.7	165.2	118.4	143.1	136.5	49.9
	III	121.8	159.7	99.7	131.1	157.1	173.1	117.3	145.2	139.2	51.6
	IV	134.5	160.0	108.3	138.4	163.9	182.7	122.5	152.2	146.4	52.4
'25	I	129.0	165.6	98.8	136.1	157.0	171.6	123.9	147.5	142.7	51.6
	II	116.6	164.8	86.7	128.1	150.5	157.8	119.8	139.7	134.8	51.5
	III	112.6	163.3	83.5	125.2	153.9	159.2	117.3	140.1	133.8	53.3
	IV	108.9	155.1	82.6	120.4	153.7	159.8	114.5	139.0	131.2	53.1
'26	I	103.9	152.4	86.8	118.1	150.3	148.8	147.7	134.8	127.8	50.6
	II	104.1	155.0	88.4	119.5	148.0	135.7	113.7	129.7	125.4	49.3
	III	106.8	154.2	88.2	120.3	166.1	126.4	114.1	131.9	127.0	47.4
	IV	109.3	144.4	88.9	117.9	192.0	115.8	115.9	136.4	128.6	41.2
'27	I	108.1	143.4	85.4	116.1	155.0	120.7	118.3	128.9	123.6	43.0
	II	111.6	145.9	82.6	118.1	140.7	127.9	118.2	127.2	123.4	43.0
	III	106.9	138.1	80.8	112.9	133.3	139.8	118.1	128.8	122.1	42.1
	IV	104.5	132.1	82.0	110.0	132.8	138.6	120.6	129.5	121.2	43.3
'28	I	108.9	143.8	80.3	115.7	123.6	136.7	120.6	126.3	121.9	43.2
	II	118.0	152.0	81.1	122.8	122.9	140.6	117.9	126.3	124.8	44.7
	III	101.1	142.0	77.9	111.2	121.0	135.3	116.7	123.6	118.4	44.3
	IV	101.9	138.1	76.3	109.8	126.0	131.5	115.3	123.5	117.5	43.7
'29	I	102.9	142.7	75.4	111.8	130.2	130.7	116.6	124.6	119.2	42.8
	II	92.8	148.3	73.2	109.1	125.0	121.2	111.1	117.9	114.2	41.1
	III	99.9	143.4	71.7	110.0	126.9	115.6	111.1	116.7	113.9	39.6
	IV	91.3	145.2	64.2	105.4	122.9	107.9	108.7	112.3	109.4	37.3
'30	I	80.8	152.1	58.3	102.3	121.1	96.4	104.9	106.7	104.8	33.0
	II	76.7	142.4	56.5	96.5	110.8	92.4	99.5	100.4	98.7	29.8
	III	77.4	132.1	48.6	91.5	109.0	77.3	94.6	94.6	92.5	26.8
	IV	71.9	130.0	51.7	89.0	105.4	68.9	91.6	88.3	88.6	26.5

\* The averages of the four quarterly figures to each year do not necessarily coincide with the annual averages, as the latter are based as far as possible on average weekly prices. See also the *Journal*, 1893, p. 221; 1895, p. 144; 1901, p. 90; and 1909, p. 70.

† Silver 60-84¢. per oz., being the parity of 1 gold to 15½ silver, = 100.

*Construction of the Tabular Statements.*

The index-numbers here given are based on the average prices for the eleven years 1867-77. Take, for instance, the *Gazette* price of English wheat :—

	<i>s.</i>	<i>d.</i>	
Average, 1867-77 ...	54	6	= 100, average point.
„ 1914 ...	35	0	= 64, or 36 per cent. <i>below</i> the average point.
„ 1920 ...	80	7	= 148, „ 48 „ <i>above</i> „ „
„ 1926 ...	53	3	= 98, „ 2 „ <i>below</i> „ „

The individual index-numbers, therefore, represent simple percentages of the average point.

The articles are grouped in six categories :—

		1867-77. Total Numbers.	Example for 1930.	
			Total Numbers.	Average.
1. Vegetable food, corn, etc. (wheat flour, barley, oats, maize, potatoes, and rice) ...	8 Index-nos.	800	619	77
2. Animal food (beef, mutton, pork, bacon, and butter) ...				
3. Sugar, coffee, and tea ...				
1—3. <i>Food</i> ...	19 „	1,900	1,826	96
4. Minerals (iron, copper, tin, lead, and coal) ...	7 „	700	784	112
5. Textiles (cotton, flax, hemp, jute, wool, and silk) ...				
6. Sundry materials (hides, leather, tallow, oils, soda, nitrate, in- digo, and timber) ...				
4—6. <i>Materials</i> ...	26 „	2,600	2,524	97
<i>General Average</i> ...	45 „	4,500	4,350	97

The general average is drawn from all forty-five descriptions, which are treated as of equal value, and is the simple arithmetical mean as shown above.

## Average Prices of Commodities.\*

No. of Article	Year.	0	1		2	3	4	5	6	7	8	1-8	9 10	
		silver †  d per oz	Wheat.  English Gazette  s. and d per qr	American.  s. and d per qr.	1 own Made white (now "G. R.") s. per sack (280 lbs.)	Barley  English Gazette.  s. and d per qr.	Oats.  English Gazette  s. and d per qr.	Maize §  American Mixed.  s. per qr	Pota- toes.*  Good English  s. per ton.	Rice.  Rangoon Carries to Arrive  s. and d per cwt.	Veg- etable Food.  Total	Beef †  Prime  d per 8 lbs.	Mid- dling.  d per 8 lbs.	
1873 ...		59½	58-8	63	51	40-5	25-5	30	160	9-6	—	65	56	
'96 ...		30½	26-2	29	25	22-11	14-9	15	55	6-2	—	45	34	
1911 ...		24½	31-8	35	29	27-3	18-10	25½	87	8-2	—	51	45	
'12 ...		28½	34-9	38	32	30-8	21-6	27½	86	10-1	—	56	49	
'13 ...		27½	31-9	36-5	30½	27-3	19-1	23½	78	8-2	—	54	49	
'14 ...		25½	35-0	40-1	33½	27-2	21-0	29½	71½	9-1	—	56½	52½	
'15 ...		23½	53-11	59-10	49	37-4	30-9	41½	93½	13-3	—	72½	67½	
'16 ...		31½	58-5	67-7	52½	51-7	33-5	52½	153½	16-10	—	81½	76½	
'17 ...		40½	75-9	83-3	58½	64-10	51-7	71½	186½	25-3	—	104½	101	
'18 ...		47½	72-9	78-7	46½	59-0	49-3	78½	142½	26-2	—	103	103	
'19 ...		57	72-10	74-10	46½	75-8	52-3	78½	198½	25-10	—	108	108	
'20 ...		61½	80-7	92-4	66	90	57-4	90½	242½	41-10	—	125	125	
'21 ..		36½	72-9	73-9	64½	54-4	34-5	38½	198	18-5	—	115	109½	
'22 ...		34½	47-10	52-11	45½	40-1	29-1	31½	130	14-10	—	88½	82	
'23 ...		31½	42-2	47-3	39½	33-8	26-8	36	101	14-10	—	79½	74½	
'24 ..		34	49-3	53-9	43½	46-9	27-2	39½	186	16-9	—	82½	76½	
'25 ...		32½	52-2	62-4	50½	42-0	27-2	38½	154	16-0	—	80	73½	
'26 ..		28½	53-3	58-9	49½	36-11	25-1	29½	127	16-3	—	74	67	
'27 ...		26½	49-3	58-3	44½	42-0	25-4	30½	136	15-11	—	70	62	
'28 ..		26½	44-8	50-10	40½	39-0	29-0	38½	133	15-0	—	74	66½	
'29 ...		24½	42-2	51-3	38½	35-5	24-7	36½	111	14-3	—	71	66	
'30 ...		17½	34-3	36-10	33½	28-3	17-2	23	93	13-0	—	73	68	
Average														
1904-13		26½	31½	36	30	25½	18½	24½	78	7½	—	51	44½	
1890-99		34	28½	31½	27½	25½	17½	19½	72	6½	—	47	37½	
'78-87		50	40	43½	34½	31½	21	25	102	8	—	55½	46	
'67-77		58½	54½	56	46	39	26	32½	117	10	—	59	50	

Index-Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

1873 ...	97-4	108	113	104	104	98	92	137	95	851	110	112
'96 ...	50-4	48	52	54	59	57	46	47	62	425	76	68
1911 ...	40-4	58	63	63	70	72	78	74	82	560	87	90
'12 ...	46-1	64	68	70	79	83	85	74	101	624	95	98
'13 ...	45-3	58	65	66	70	73	73	67	82	554	92	98
'14 ...	41-6	64	72	73	70	81	90	61	91	602	96	105
'15 ...	38-9	99	107	106	96	118	128	80	132	866	122	136
'16 ...	50-4	107	121	114	132	128	163	131	168	1,064	138	154
'17 ...	65-8	139	149	127	166	199	221	160	252	1,413	177	202
'18 ...	76-4	134	140	102	151	190	241	122	262	1,342	174	207
'19 ...	85-3	134	134	102	194	201	242	170	258	1,435	183	216
'20 ...	76-1	148	165	143	231	221	279	207	418	1,812	212	250
'21 ...	48-1	133	132	140	139	132	118	169	184	1,147	195	220
'22 ...	51-6	88	95	100	103	112	96	111	148	853	150	164
'23 ...	49-4	77	84	86	86	103	111	86	148	781	134	149
'24 ...	50-7	90	96	95	120	105	122	159	167	954	139	152
'25 ...	52-5	96	111	109	108	105	119	132	160	940	136	147
'26 ...	47-1	98	105	107	95	96	92	109	163	865	125	134
'27 ...	42-8	90	104	98	108	97	95	116	159	867	119	124
'28 ...	44-0	82	91	87	100	112	118	114	150	854	125	133
'29 ...	40-2	77	91	84	91	95	112	95	143	758	120	132
'30 ...	29-0	63	66	72	72	66	71	79	130	619	124	136

\* The annual prices are the average monthly or weekly quotations, except potatoes, which are the average weekly quotations during the eight months January to April and September to December.

† Not included in the general average.

‡ Meat (9-13), by the carcase, in the London Central Meat Market.

§ La Plata from 1924.

## Average Prices of Commodities—Contd.

No. of Article }	11 12 Mutton		13 Pork.	14 Bacon.	15 Butter.	9-15  Animal Food.  Total.	16A 16B 17 Sugar.			18A*	18B*	18
	Prime.	Mid- dling.	Large and Small, average.	Water- ford.	Fries- land, Fine to Finest.		British West Indian Refining    s. per cwt.	Beet, German, 88 p. c., f.o.b. s. per cwt.	Java, Floating Cargoes. s. per cwt.	Ceylon Plan- ta- tion, Low Mid- dling.† s. per cwt.	Rio, Good. s. per cwt.	Mean of 18A and 18B.
Year.	d. per 8 lbs.	d. per 8 lbs.	d. per 8 lbs.	s. per cwt.	s. per cwt.							
1873 ...	71	63	54	81	123	—	22½	25	28	100	86	—
'96 ...	53	39	35	50	98	—	10½	10½	12½	95	58	—
1911 ...	55	49	46	56	121	—	11½	13	14	83	58	—
'12 ...	59	54	50	69	123	—	11	12½	13½	87	66	—
'13 ...	62	56	55	77	119	—	9½	9½	10½	81	53	—
'14 ...	64	57½	49	75½	120	—	11½	12½	13½	79	45	—
'15 ...	75½	69½	72	93½	141	—	14½	17½†	18½	78½	43½	—
'16 ...	93½	86½	87½	109½	191	—	24½	22½†	26½	77½	50	—
'17 ...	114½	109½	110½	148	216	—	31½	25½†	32½	94½	58	—
'18 ...	109½	109½	128½	183	247½	—	33	26½†	35½	128½	69	—
'19 ...	114	114	128	190½	252	—	38½	34½†	43½	145½	114½	—
'20 ...	144½	144½	168½	239½	301	—	58	65½†	74½	148	111½	—
'21 ...	130½	125½	121½	179	250	—	19½	18½†	22	120½	63	—
'22 ...	125	121½	101	145½	202½	—	15	14½	15, 5½	120½	74½	—
'23 ...	114½	107½	89	113½	186	—	25½	23½	24½	117½	55	—
'24 ...	111½	103½	70	106	211	—	23½	20½	21½	152½	85½	—
'25 ...	106½	98½	84½	128½	206½	—	16½	11½	12½	153½	98, 5½	—
'26 ...	89	80½	98½	130	173	—	16, 7½	11½	12½	154½	89, 1½	—
'27 ...	86	79½	85	102½	178	—	16, 7½	12½	13, 5½	143½	71½	—
'28 ...	92½	87	77	101½	185½	—	13½	10½	11½	143, 5½	81½†	—
'29 ...	89½	83	91	116½	180½	—	11, 7½	8, 5½	8½	141½	74½†	—
'30 ...	92	86	89	105½	146½	—	8½	5½†	6½	106½	42½	—
Average												
1904-13	58½	51½	47½	67	113	—	10½	10½	12	75½	43½	—
1890-99	54½	41½	42½	59	100	—	11½	11½	13½	98	62	—
'78-87	64½	53	49	71	116	—	17	18	21½	78	52	—
'87-77	63	55	52	74	125	—	23	24	28½	87	64	—

Index-Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

	113	114	104	109	98	760	101	98	115	134	125
1873 ...	113	114	104	109	98	760	101	98	115	134	125
'96 ...	84	71	67	68	78	512	46	44	109	91	100
1911 ...	87	89	88	89	97	627	52	49	95	91	93
'12 ...	94	98	96	93	98	672	49	47	100	103	102
'13 ...	99	102	105	104	95	695	40	38	93	83	88
'14 ...	102	105	94	102	96	700	50	48	91	70	81
'15 ...	119	127	138	126	113	881	87	66	90	68	79
'16 ...	148	157	169	148	153	1,067	100	93	90	78	84
'17 ...	182	199	212	200	173	1,345	121	115	109	91	100
'18 ...	174	199	248	247	198	1,447	127	125	148	110	129
'19 ...	181	207	246	258	202	1,493	155	153	167	180	174
'20 ...	230	263	324	324	241	1,844	263	262	170	174	172
'21 ...	208	228	234	242	200	1,527	81	77	140	98	119
'22 ...	199	221	194	196	162	1,286	62	54	140	116	128
'23 ...	182	196	171	154	149	1,135	104	87	135	86	111
'24 ...	177	188	135	143	169	1,103	93	75	175	133	154
'25 ...	169	180	162	174	165	1,133	60	43	176	154	165
'26 ...	141	146	190	176	138	1,050	60	44	178	139	159
'27 ...	136	145	163	138	142	967	62	47	165	112	139
'28 ...	146	158	148	137	149	996	51	40	165	127	146
'29 ...	142	151	175	157	144	1,021	42	31	162	117	140
'30 ...	146	155	171	143	117	992	31	22	123	66	95

\* Index-numbers not included in general average.

† Best India good middling from 1906.

‡ Raw Centrifugals, 96 per cent. Pol., from 1924.

† Comparative values.

|| White Javas, C.I.F., from 1924.

## Average Prices of Commodities—Contd.

No. of Article.	Year.	19A*	19C*	19B*	19	16-19	1-19	20A	20B	21	22	23	
		Tea.				Sugar, Coffee, and Tea.  Total.	Food.  Total.	Iron.		Copper.		Tin.	
		Oongou, (com- mon.	Indian, Good Medium.	Average Import Price.  d. and dec. per lb.	Mean of 191 and 19B.			Scottish Pig.  s. and d. per ton.	Cleveland (Mid- dles- brough) Pig.  s. and d. per ton.	Bars, Com- mon.  £ per ton.	Stand- ard.  £ per ton.		English Tough Cake.  £ per ton.
		d. per lb.	d. per lb.										
1873 ...	12	—	—	16-67	—	—	—	117-3	—	12½	84	92	132
'96 ...	4	7½	—	9-55	—	—	—	46-10	38-2	5	47	50	60
1911 ...	5½	8½	9-00	—	—	—	—	53-5	47-3	6½	56	60	191
'12 ...	5½	8½	8-78	—	—	—	—	64-2	58-2	7½	73	78	210
'13 ...	5	8½	9-06	—	—	—	—	65-6	58-3	7½	68	73½	201
'14 ...	6	8½	9-19	—	—	—	—	57-1	51-0	7	59½	64½	151
'15 ...	8½	10½	11-01	—	—	—	—	71-2	65-2	10½	72½	82½	164
'16 ...	8	10½	11-29	—	—	—	—	90-0	84-0	13½	115½	134	182
'17 ...	16½	15½	14-68†	—	—	—	—	95-7	89-7	13½	124½	136½	238
'18 ...	20½	16	15-0	—	—	—	—	101-0	95-0	14	115½	126	331
'19 ...	13½	15	15-5	—	—	—	—	143-1	137-1	19½	92	99½	257
'20 ...	11½	9½	14-97	—	—	—	—	214-11	208-11	28½	97½	112½	302
'21 ...	4½	7	12-4	—	—	—	—	168-6	137-4	19½	69½	72½	171
'22 ...	8½	13½	14-9	—	—	—	—	99-10	90-7	11½	63½	66½	162
'23 ...	11	17½	17-58	—	—	—	—	108-0	108-9	11½	65½	69½	206
'24 ...	9½	17½	19-0	—	—	—	—	96-8	88-2	12½	63½	67½	251
'25 ...	7½	14½	18-34	—	—	—	—	83-4	72-8	11½	61½	65½	267
'26 ...	7½	16½	18-82	—	—	—	—	87-2	87-6	11½	58½	63½	297
'27 ...	6½	14½	18-58	—	—	—	—	80-5	73-0	11½	55½	60½	303½
'28 ...	6½	12½	16-84	—	—	—	—	69-9	65-9	9½	63½	66½	229½
'29 ...	6½	11½	16-11	—	—	—	—	74-0	70-3	9½	75½	78½	207½
'30 ...	5½	9½	15-12	—	—	—	—	76-0	67-0	9½	54½	58½	144½
Average 1904-13	7½	7½	8½	—	—	—	—	57½	51½	6½	67½	72	164½
1890-99	4½	7½	9½	—	—	—	—	47	41½	5½	50	53	81
'78-87	6½	—	12½	—	—	—	—	46	38	5½	55	60	89
'67-77	11½	—	17½	—	—	—	—	69	60	8½	75	81	105
Index-Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.													
1873 ...	107	—	97	102	426	2,037	170	—	152	112	—	126	
'96 ...	36	—	56	46	236	1,173	68	—	61	63	—	57	
1911 ...	47	—	52	50	244	1,431	78	—	77	75	—	182	
'12 ...	48	—	51	50	248	1,544	95	—	89	97	—	200	
'13 ...	44	—	52	48	214	1,463	96	—	94	91	—	191	
'14 ...	53	—	53	53	232	1,534	84	—	85	79	—	144	
'15 ...	74	—	64	69	281	2,028	106	—	128	97	—	156	
'16 ...	71	—	65	68	345	2,476	135	—	166	154	—	173	
'17 ...	150	—	85	117	453	3,211	144	—	166	166	—	227	
'18 ...	186	—	87	137	518	3,307	152	—	170	154	—	315	
'19 ...	120	—	90	105	587	3,515	217	—	234	123	—	245	
'20 ...	100	—	88	94	791	4,447	329	—	343	130	—	288	
'21 ...	39	—	72	55	332	3,006	237	—	232	92	—	163	
'22 ...	77	—	86	82	326	2,465	148	—	136	84	—	154	
'23 ...	98	—	102	100	402	2,318	168	—	144	88	—	196	
'24 ...	82	—	110	96	418	2,475	143	—	152	84	—	239	
'25 ...	70	—	106	88	356	2,429	121	—	144	82	—	254	
'26 ...	69	—	109	89	352	2,267	135	—	139	77	—	283	
'27 ...	60	—	108	84	332	2,166	119	—	136	74	—	289	
'28 ...	56	—	98	77	314	2,164	105	—	120	85	—	219	
'29 ...	54	—	93	74	287	2,096	112	—	118	101	—	198	
'30 ...	46	—	88	67	215	1,826	111	—	121	73	—	138	

Index-numbers not included in the general average.

† Approximate.

‡ Nominal.

## Average Prices of Commodities—Contd.

No. of Article }	24 Lead.	25A Walsen Hetton in London.	25B New- castle Steam.	26 Average Export Price.	20-26 Mine- rals. Total.	27 Mid- dling Ameri- can.	28 Fair Dhol- eralah.	29A Petro- gram.	29B Russian Average Import Price.	30A Manila Fair Roping.	30B Petro- gram Clean.	31 Good Med- ium.
Year.	English Fig.	£ per ton.	s. per ton.	s. and dec. per ton.		d. per lb.	d. per lb.	£ per ton.	£ per ton.	£ per ton.	£ per ton.	£ per ton.
1873 ...	23½	32	—	20-90	—	9	6 ½	47½	44	43	36	18
'96 ...	11½	15½	8	8-85	—	4	3 ½	26	27	17½	25	12½
1911 ...	14½	17½	10½	11-43	—	7-04	6	37	43½	20	33	20½
'12 ...	18½	21½	14½	12-70	—	6-45	5 ½	36½	40½	26	37	21
'13 ...	19½	21½	15½	13-94	—	7-01	5 ½	34	41½	31½	38	26½
'14 ...	19½	21½	14½	13-65	—	6-41	4 ½	33	38	26½	43	27½
'15 ...	24	30½	21½	16-96	—	5-87	4½	59½	66½	41½	60½	21½
'16 ...	32½	27½	41½	24-64	—	9-00	7	76½	85½	54½	71	31
'17 ...	32½	27½	30	27-16	—	16-55	13½	113½	151½	84½	105	39½
'18 ...	32½	33-6	33½	30-6	—	22-3	17½	120½	156½	99½	166	39½
'19 ...	29½	45-3	45½	46-2	—	19-65	14½	120½	174½	58½	147½	50½
'20 ...	40	32	51½	79-8	—	23-14	13½	120½	346½	65½	145½	44½
'21 ...	24½	32½	29	34-83	—	9-4	5 ½	112½	118½	40½	145½	27½
'22 ...	25½	34½	24½	24-16	—	12-10	8	95	84½	33½	57½	30½
'23 ...	28½	32½	28	25-13	—	15-25	10	83½	84½	33½	57	26
'24 ...	35½	27½	22½	23-38	—	16-26	11-03	120	104½	44	81	31½
'25 ...	37½	29½	16½	20-08	—	12-64	11-01	92½	120½	46½	89½	49½
'26 ...	32½	**30½	**16½	18-59	—	9-40	7-75	65	72½	43	74½	43½
'27 ...	25½	23½	14½	17-80	—	9-54	8-27	95½	74½	43	66½	32½
'28 ...	22½	21½	13½	15-67	—	10-92	8-66	98½	91½	37½	63½	33½
'29 ...	24½	23½	15½	16-13	—	10-26	7-73	76½	71½	37½	61	32
'30 ...	19½	24½	14½	16-64	—	7-49	5-12	53½	60½	26½	48½	20
Average												
1904-13	15½	18½	11½	11½	—	6½	5	32½	36½	30½	31½	18½
1890-99	12	17½	10½	10½	—	4½	3	27	27	26½	25	12½
'78-87	14	16½	8½	9	—	6	4½	33	34	35½	26½	15
'67-77	20½	22	12½	12½	—	9	6½	46	48	43	35	19

Index-Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

1873 ...	117	145	—	167	989	100	92	97	101	95
'96 ...	56	68	—	71	444	48	46	56	55	64
1911 ...	70	81	—	91	654	78	89	86	68	107
'12 ...	89	99	—	102	771	72	79	82	81	111
'13 ...	93	98	—	112	775	78	84	80	89	140
'14 ...	95	97	—	109	693	71	67	76	89	143
'15 ...	117	140	—	136	880	65	64	134	130	111
'16 ...	159	125	—	197	1,109	100	104	172	161	163
'17 ...	158	125	—	217	1,203	183	201	282	243	207
'18 ...	158	153	—	245	1,347	248	253	294	341	207
'19 ...	143	206	—	370	1,538	218	219	313	264	264
'20 ...	195	145	—	638	2,068	257	203	495	270	236
'21 ...	118	147	—	279	1,288	104	86	246	237	145
'22 ...	123	156	—	193	994	134	118	191	116	162
'23 ...	139	147	—	201	1,083	169	148	179	116	137
'24 ...	175	125	—	187	1,105	181	163	239	160	167
'25 ...	183	135	—	161	1,080	140	163	227	174	261
'26 ...	157	138	—	149	1,078	104	115	147	151	231
'27 ...	125	105	—	142	990	106	123	181	141	172
'28 ...	109	97	—	125	860	121	128	203	130	178
'29 ...	117	106	—	129	881	114	114	157	126	168
'30 ...	95	113	—	133	784	83	76	121	96	105

\* Approximate prices.

† Approximate.

‡ Nominal.

§ Best Yorkshire house after 1916

|| Now No. 1 Oomra, Fine.

¶ Livonian Z.E. from 1921.

\*\* Average price January-April, 1926.

## Average Prices of Commodities—Contd.

No. of Article	32A	32B	33	34	27-34	35A	35B	35C	36A	36B	37
	Wool.			Shk.		Hides.			Leather.		Tallow.
Year.	Merino, Port Phillip Average Fleeced.	Merino, Adelaide Average Greasy.	English, Lincoln Half Hogs.	Tasmanian.	Textiles. Total.	River Plate, Dry.	River Plate, Salted.	Average Import Price.	Dressing Hides.	Average Import Price.	Town.
	d. per lb.	d. per lb.	d. per lb.	s. per lb.		d. per lb.	d. per lb.	d. and dec. per lb.	d. per lb.	d. per lb.	s. per cwt.
1873 ...	25	11½	24½	21½	—	11	8½	—	18½	—	44
'96 ...	13	6½	11½	10½	—	6½	5½	4-89	13½	13½	21
1911 ...	17½	8½	10	10½	—	9½	7½	7-17	17	17½	33½
'12 ...	17½	9½	10½	10½	—	10½	8½	7-51	17½	17½	33
'13 ...	18	9½	12½	11	—	12½	9½	8-62	19½	19½	34½
'14 ...	18½	9½	12½	10½	—	13½	9½	9-11	21½	19½	31½
'15 ...	21½	10½	17½	9½	—	13	11	10-04	28½	21½	36½
'16 ...	32½	16½	20	16½	—	14½	13½	11-70	28½	27	46½
'17 ...	46½	23½	20½	21½	—	20	16	15-52	35	34½	62½
'18 ...	47½	23½	18½	25½	—	20½	13½	15-9	32½	32½	81½
'19 ...	67	32½	22½	26	—	22½	19½	17-1	36½	40½	87½
'20 ...	79½	32	22	38½	—	20½	18½	20-1	43½	71½	75
'21 ...	31½	11½	8½	26½	—	9½	8½	9-58	25½	46½	36½
'22 ...	39	17½	9½	28½	—	9½	8½	8-06	24½	36	34½
'23 ...	43½	20½	12	24½	—	9½	8½	8-23	23½	31½	36½
'24 ...	53½	25½	18½	23½	—	10½	8½	8-63	22½	33½	42½
'25 ...	41½	17½	17½	18½	—	11½	8½	9-87	23	33	42½
'26 ...	36½	16½	15	15½	—	10½	8	9-32	21½	35½	38½
'27 ...	38½	17½	15½	15½	—	12½	10½	9-85	22½	36½	33½
'28 ...	37	17½	17½	14	—	15½	11½	12-69	23½	37½	36½
'29 ...	35½	13½	16½	13½	—	10½	8½	10-80	19½	38½	36½
'30 ...	18½	8½	10½	10½	—	6½	6½	7-80	18½	33½	28½
Average 1904-13	17½	9	10½	11½	—	9½	7½	6½	16	17	31½
1890-99	13½	6½	10	11½	—	6½	5	5	13½	13½	25
'78-87	18½	8½	11½	15	—	8½	6½	6½	15	17	35½
'67-77	21½	9½	19½	23	—	9	7	6½	16	18½	45
Index-Numbers (or Percentages) of Prices, the Average of 1887-77 being 100.											
1873 ...	118	—	124	95	822	120	—	—	114	—	97
'96 ...	62	—	58	46	435	77	—	—	84	—	77
1911 ...	83	—	51	47	609	106	—	—	99	—	74
'12 ...	86	—	53	46	610	114	—	—	101	—	73
'13 ...	88	—	63	48	670	133	—	—	112	—	76
'14 ...	90	—	64	47	647	139	—	—	118	—	70
'15 ...	104	—	88	43	739	149	—	—	145	—	81
'16 ...	159	—	101	71	1,031	174	—	—	160	—	104
'17 ...	219	—	106	94	1,535	225	—	—	200	—	139
'18 ...	222	—	95	112	1,772	218	—	—	188	—	182
'19 ...	315	—	114	113	1,820	258	—	—	222	—	195
'20 ...	359	—	111	168	2,099	257	—	—	330	—	167
'21 ...	140	—	44	115	1,117	123	—	—	205	—	81
'22 ...	180	—	49	125	1,075	114	—	—	174	—	77
'23 ...	206	—	61	105	1,121	113	—	—	158	—	81
'24 ...	254	—	96	102	1,362	119	—	—	163	—	94
'25 ...	188	—	87	79	1,319	132	—	—	161	—	94
'26 ...	170	—	76	69	1,063	121	—	—	164	—	85
'27 ...	177	—	78	67	1,045	142	—	—	172	—	75
'28 ...	174	—	91	61	1,086	172	—	—	176	—	82
'29 ...	156	—	81	60	976	129	—	—	166	—	81
'30 ...	86	—	54	48	669	92	—	—	150	—	64

\* Port Phillip fleece washed nominal since 1895, exactly in proportion with the value of clean wool.

† Common New Style from 1921.

## Average Prices of Commodities—Contd.

No. of Article } Year.	38 Oil.		40A	40B	41	42	43	44	45A	45B	35-45	20-45	1-45
	Oil.		Seeds.	Petro- leum.*	Soda.	Nitrates of Soda.	Indigo.	Tinber.	Sundry Materials.	Materials.	Grand Total.	Total.	Total.
	Palm.	Olive.	Lin- seed.	Lin- seed.	Re- fined.	Crystals.	Bengal, Good Con- suming.	Hevn. Average Import Price.	Sawn or Split, Average Import Price.	Total.	Total.	Total.	Total.
	£ per ton.	£ per ton.	£ per ton.	s. per qr.	d. per gall.	s. per ton.	s. per cwt.	s. per lb.	s. per load.	s. per load.			
1873 ...	38	43	32	62	15½	100	15½	6½	65	62	—	—	—
'96 ...	22	30	17½	33	5½	42	8	4½	40	44	—	—	—
1911 ...	34½	50	42½	70	5½	57	10	3	38	57	—	—	—
'12 ...	33	48	35½	60	8½	53	11½	2½	41	60	—	—	—
'13 ...	35½	49½	24½	45½	8½	47½	11½	2½	40	63	—	—	—
'14 ...	37½	50½	24½	48½	7½	47½	10½	5½	41½	64½	—	—	—
'15 ...	34½	51½	30½	57½	8½	48½	12½	13½	58½	94½	—	—	—
'16 ...	44½	59½	41½	80½	12	78½	17½	13½	148½	148½	—	—	—
'17 ...	46	115½	56½	112½	16½	89½	25	10½	97½	210	—	—	—
'18 ...	44½	198½	63½	131½	21½	82½	27½	9	107½	271	—	—	—
'19 ...	69½	200½	92½	139½	17½	118½	24½	9½	137½	232½	—	—	—
'20 ...	69½	200½	88½	157	25½	150½	24½	14½	119½	261½	—	—	—
'21 ...	36½	80½	31½	72½	22½	140	18½	11½	68½	156½	—	—	—
'22 ...	34½	75½	39½	75½	15½	123	14½	9½	46½	117½	—	—	—
'23 ...	36½	66½	42½	77½	13	103	13½	7½	48	131½	—	—	—
'24 ...	40½	79½	42½	81½	13½	101½	13½	6½	49½	122	—	—	—
'25 ...	40½	73½	43½	80½	13½	100	13½	5½	47½	122½	—	—	—
'26 ...	37½	79½	32½	63½	13	100	13½	5½	48½	107	—	—	—
'27 ...	34½	102½	31½	64½	13	100	12½	5½	45½	107½	—	—	—
'28 ...	35½	80½	29½	66½	11½	100	10½	5½	45½	111½	—	—	—
'29 ...	34½	72	35½	74½	12½	100	10½	5½	44½	107½	—	—	—
'30 ...	25½	52½	36½	61½	12½	100	9½	5½	44½	102½	—	—	—
Average	31½	43½	26½	49½	6½	60	10½	3	38	56	—	—	—
1904-13	24½	35	19½	38	5½	53	8½	4½	40	45	—	—	—
1890-99	32½	40	23	46	6½	62	12½	6	47	47	—	—	—
'78-87	39	50	30	60	12½*	92	14	7½	60	54	—	—	—
'67-77	39	50	30	60	12½*	92	14	7½	60	54	—	—	—

Index-Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

	97	86	105	122	109	110	92	111	1,163	2,974	5,011
1873 ...	97	86	105	122	109	110	92	111	1,163	2,974	5,011
'96 ...	56	60	56	44	46	57	59	74	690	1,569	2,742
1911 ...	88	100	125	43	62	71	41	83	892	2,155	3,586
'12 ...	85	96	106	66	58	80	38	89	906	2,287	3,831
'13 ...	90	99	78	68	52	82	38	90	918	2,363	3,826
'14 ...	84	101	82	61	52	78	80	93	958	2,298	3,832
'15 ...	89	104	97	71	53	90	184	134	1,197	2,816	4,844
'16 ...	114	119	135	96	86	128	183	202	1,501	3,641	6,117
'17 ...	118	231	187	129	98	178	142	270	1,917	4,655	7,866
'18 ...	115	396	216	170	90	194	124	332	2,225	5,344	8,661
'19 ...	178	400	258	138	128	177	126	325	2,405	5,763	9,278
'20 ...	179	400	272	203	164	177	200	335	2,684	6,851	11,298
'21 ...	95	160	116	177	152	135	158	198	1,600	3,985	6,991
'22 ...	89	151	127	122	134	102	128	143	1,361	3,430	5,895
'23 ...	93	133	134	104	112	96	103	157	1,284	3,488	5,806
'24 ...	103	160	138	105	111	97	84	151	1,325	3,792	6,267
'25 ...	104	147	137	105	109	96	79	150	1,314	3,713	6,142
'26 ...	96	159	106	104	109	95	78	137	1,254	3,395	5,662
'27 ...	88	205	107	104	109	90	76	134	1,302	3,337	5,503
'28 ...	92	161	108	94	109	78	76	138	1,286	3,232	5,396
'29 ...	89	144	122	102	109	73	76	134	1,225	3,082	5,178
'30 ...	65	104	110	102	109	70	76	129	1,071	2,524	4,350

\* Petroleum average, 1873-77.

† Nominal.



## MISCELLANEA

## MATHEMATICAL THEOREMS INVOLVED IN THE ANALYSIS OF VARIANCE.

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IN this paper proofs are given of the essential theorems involved in the "Analysis of Variance" method which R. A. Fisher has invented. An endeavour has been made to treat them in an elementary manner, so as to make them available in one place for the mathematical-statistical student of average ability, or any others interested in the subject. For this reason somewhat full proofs have been given and points dealt with in detail which will doubtless appear obvious to the highly trained mathematical statistician. No claim is made to originality, except perhaps in Sections III and IV, where two results are given which may conceivably be new.

I. *Distribution of Estimates of Variance and their Ratios.*

Suppose we have a hypothetically infinite population in which a variate  $x$  is normally distributed with mean  $m$  and variance  $\sigma^2$ . Then in a random sample of  $n'$  individuals the chance of getting a set of values  $x_1, x_2 \dots x_{n'}$  in the interval  $dx_1 dx_2 \dots dx_{n'}$ , is

$$df = \left( \frac{1}{\sqrt{2\pi\sigma}} \right)^{n'} e^{-\frac{1}{2} \sum_{r=1}^{n'} \left( \frac{x_r - m}{\sigma} \right)^2} dx_1 dx_2 \dots dx_{n'}. \quad (1)$$

(i)  $x_1, x_2 \dots x_{n'}$  are here supposed all independent.

Let  $\bar{x}$  be the sample mean, i.e.  $\bar{x} = \frac{1}{n'} \sum_{r=1}^{n'} x_r$ .

Let  $s^2$  be given by  $s^2 = \frac{1}{n' - 1} \sum_{r=1}^{n'} (x_r - \bar{x})^2$ .

Since  $\sum_{r=1}^{n'} (x_r - m)^2 = \sum_{r=1}^{n'} (x_r - \bar{x})^2 + n'(\bar{x} - m)^2$ , (1) may be written

$$\begin{aligned} df &= \left( \frac{1}{\sqrt{2\pi\sigma}} \right)^{n'} e^{-\frac{n'(\bar{x}-m)^2}{2\sigma^2}} e^{-\frac{1}{2} \sum_{r=1}^{n'} \left( \frac{x_r - \bar{x}}{\sigma} \right)^2} dx_1 \dots dx_{n'} \\ &= \left( \frac{1}{\sqrt{2\pi\sigma}} \right)^{n'} e^{-\frac{n'(\bar{x}-m)^2}{2\sigma^2}} e^{-\frac{(n'-1)s^2}{2\sigma^2}} dx_1 \dots dx_{n'}. \quad (2) \end{aligned}$$

We must now convert the differential element  $dx_1 dx_2 \dots dx_{n'}$ .

Suppose in space of  $n'$  dimensions we take through a point  $O$ ,  $n'$  axes mutually at right angles, then using these  $n'$  lines as co-ordinate axes we may represent our sample point  $P$  by the co-ordinates  $x_1, x_2 \dots x_{n'}$ .

The equation  $\bar{x} = \frac{1}{n'}(x_1 + x_2 + \dots + x_{n'})$  may be interpreted as meaning that for a given value of  $\bar{x}$ ,  $P$  lies in the hyper-plane

$$x_1 + x_2 + \dots + x_{n'} = n'\bar{x}.$$

If  $M$  be the foot of the perpendicular from  $O$  on to this plane

$$OM = \bar{x}\sqrt{n'}$$

and

$$PM = \sqrt{\sum_{r=1}^{n'} (x_r - \bar{x})^2} = s\sqrt{n' - 1}.$$

We may thus use  $OM$ ,  $PM$  and  $n' - 2$  independent angular functions as generalised cylindrical co-ordinates of the point  $P$ , and obtain

$$dx_1 dx_2 \dots dx_{n'} = f_1(\theta_1) f_2(\theta_2) \dots f_{n'-2}(\theta_{n'-2}) s^{n'-2} d\bar{x} ds.$$

The reason for the exponent  $(n' - 2)$  of  $s$  in this expression is that for a constant value of  $s$ ,  $P$  lies on a hyper-sphere with centre  $M$ , the dimensions of whose surface are  $n' - 2$ . (This may easily be seen by analogy from the case of samples of 3, when  $P$  lies on a circle.)

The angular functions, being entirely independent of  $\bar{x}$  and  $s$ , will, when integrated over the whole range of their possible values, give rise simply to a constant; thus we have

$$df = Ce^{-\frac{n'(\bar{x}-m)^2}{2\sigma^2}} e^{-\frac{(n'-1)s^2}{2\sigma^2}} s^{n'-2} d\bar{x} ds \dots \quad (3)$$

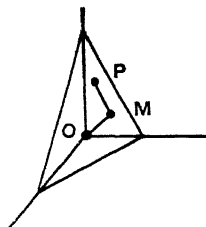
Thus the distribution of  $\bar{x}$  and  $s$  are quite independent, that of  $s$  being

$$df = K \left(\frac{s}{\sigma}\right)^{n'-2} e^{-\frac{(n'-1)s^2}{2\sigma^2}} \frac{ds}{\sigma} \dots \quad (4)$$

By integration we may show that

$$K = \frac{(n' - 1)^{\frac{n'-1}{2}}}{2^{\frac{n'-3}{2}}} \frac{1}{\Gamma\left(\frac{n' - 1}{2}\right)} \dots \quad (5)$$

It follows that the mean value of  $s^2$  in all possible samples is  $\sigma^2$ .  $s$  is also the value of  $\sigma$  obtained by applying the method of maximum-likelihood to (4).  $s^2$  is thus an unbiased estimate of  $\sigma^2$ ; it may also be shown to be efficient; that is, no other estimate of  $\sigma^2$  can have a smaller sampling variance. We call  $s^2$  an estimate of  $\sigma^2$ , based on  $n' - 1$  degrees of freedom.



The essential reason why  $n' - 1$  and not  $n'$  is our correct divisor of  $S(x - \bar{x})^2$ , in order to get an unbiased estimate of  $\sigma^2$ , is that our estimate of the mean in this expression has also been made from the sample.

We can get a clearer idea of why this is so if we suppose that we had a previous knowledge of  $m$ , the mean of the population; then we might make an estimate of  $\sigma^2$  from  $S(x_r - m)^2$ ; the correct divisor would now be  $n'$ . For consider the expression (1) and let

$$s' = \frac{1}{n'} S(x_r - m)^2.$$

Suppose now our co-ordinates are the deviations from the fixed population mean.

The point  $P$  now lies on a hyper-sphere the dimensions of whose surface are  $n' - 1$ ; therefore when we transform the differential element  $dx_1 dx_2 \dots, dx_{n'}$  into polar co-ordinates we obtain

$$dx_1 dx_2 \dots dx_{n'} = f_1(\theta_1) f_2(\theta_2) \dots f_{n'-1}(\theta_{n'-1}) s'^{n'-1} ds'$$

and the distribution of  $s'$  is easily seen to be

$$df = K e^{-\frac{n's'^2}{2\sigma^2}} \left(\frac{s'}{\sigma}\right)^{n'-1} \frac{ds'}{\sigma} \quad \dots \quad (6)$$

which is the same result as (4) with  $n'$  instead of  $n' - 1$ . Our unbiased and efficient estimate would now be  $S \frac{(x_r - m)^2}{n'}$ .

(ii) Now let us suppose that in addition to the relation between the sample mean and its individual values, there are  $p$  independent relations between  $x_1, x_2 \dots x_{n'}$ , and now let  $s^2 = \frac{1}{n' - p - 1} S(x - \bar{x})^2$ . The point  $P$  which represents our sample now lies not only in the hyper-plane

$$n'\bar{x} = x_1 + x_2 + \dots + x_{n'}$$

but in  $p$  other hyper-planes. The result will be that for a fixed value of  $s$ ,  $P$  lies on a hyper-sphere, with centre  $M$ , the dimensions of whose surface are now only  $n' - p - 2$ . Otherwise the argument is exactly the same as before.

The distribution of  $S$  is therefore now

$$df = K e^{-\frac{(n'-p-1)s^2}{2\sigma^2}} \left(\frac{s}{\sigma}\right)^{n'-p-2} \frac{ds}{\sigma}$$

$$\text{where} \quad K = \frac{(n' - p - 1)^{\frac{n'-p-1}{2}}}{2^{\frac{n'-p-3}{2}}} \frac{1}{\Gamma\left(\frac{n' - p - 1}{2}\right)} \quad \dots \quad (7)$$

and  $s^2$  is an unbiased and efficient estimate of  $\sigma^2$ .

We may sum up these results by saying that if  $n$  is our number of degrees of freedom and if  $s^2$  is given by

$$s^2 = \frac{1}{n} \sum_{r=1}^{n'} (x_r - \bar{x})^2$$

$n'$  being the number of our observations,  $s^2$  is our unbiased and efficient estimate of  $\sigma^2$ , and the distribution of  $s$  given by

$$df = \frac{n^{\frac{n}{2}}}{2^{\frac{n-2}{2}} \Gamma\left(\frac{n}{2}\right)} e^{-\frac{ns^2}{2\sigma^2}} \left(\frac{s}{\sigma}\right)^{n-1} \frac{ds}{\sigma}$$

We notice that the number of degrees of freedom is equal to the number of observations made, less the number of independent relations between them, account being taken of the fact that the population mean is itself estimated from the sample.

(iii) Suppose now we have two estimates of the same variance,  $s_1^2$  and  $s_2^2$ , based respectively on  $n_1$  and  $n_2$  degrees of freedom.

Let  $\omega = \frac{s_1^2}{s_2^2}$ , then  $s_1 = s_2 \omega$

The distribution of  $s_1$  is given by

$$\begin{aligned} df &= \frac{n_1^{\frac{n_1}{2}}}{2^{\frac{n_1-2}{2}} \Gamma\left(\frac{n_1}{2}\right)} e^{-\frac{n_1 s_1^2}{2\sigma^2}} \left(\frac{s_1}{\sigma}\right)^{n_1-1} \frac{ds_1}{\sigma} \\ &= \frac{n_1^{\frac{n_1}{2}}}{2^{\frac{n_1-2}{2}} \Gamma\left(\frac{n_1}{2}\right)} e^{-\frac{n_1 \omega^2 s_2^2}{2\sigma^2}} \frac{(\omega s_2)^{n_1-1}}{\sigma^{n_1}} s_2 d\omega \quad \dots \quad (8) \end{aligned}$$

for a given value of  $s_2$ .

But the distribution of  $s_2$  is given by

$$df = \frac{n_2^{\frac{n_2}{2}}}{2^{\frac{n_2-2}{2}} \Gamma\left(\frac{n_2}{2}\right)} e^{-\frac{n_2 s_2^2}{2\sigma^2}} \left(\frac{s_2}{\sigma}\right)^{n_2-1} \frac{ds_2}{\sigma} \quad \dots \quad (9)$$

Therefore to obtain the distribution of  $\omega$  we need only to multiply (8) by (9) and integrate for  $s_2$  from 0 to  $\infty$ .

We obtain :—

$$df = d\omega \int_0^\infty \frac{n_1^{\frac{n_1}{2}} n_2^{\frac{n_2}{2}}}{2^{\frac{n_1+n_2-2}{2}} \Gamma\left(\frac{n_1}{2}\right) \Gamma\left(\frac{n_2}{2}\right)} e^{-\frac{(n_1 \omega^2 + n_2) s_2^2}{2\sigma^2}} \frac{s_2^{n_1+n_2-1} \omega^{n_1-1}}{\sigma^{n_1+n_2}} ds_2$$

$$= \frac{2n_1^{\frac{n_1}{2}} n_2^{\frac{n_2}{2}} \Gamma\left(\frac{n_1+n_2}{2}\right)}{\Gamma\left(\frac{n_1}{2}\right) \Gamma\left(\frac{n_2}{2}\right)} \frac{\omega^{n_1-1} dw}{(n_1 \omega^2 + n_2)^{\frac{n_1+n_2}{2}}}$$

If now  $z = \log \omega = \log \frac{s_1}{s_2}$

we have for the distribution of  $z$

$$df = \frac{2n_1^{\frac{n_1}{2}} n_2^{\frac{n_2}{2}} \Gamma\left(\frac{n_1+n_2}{2}\right)}{\Gamma\left(\frac{n_1}{2}\right) \Gamma\left(\frac{n_2}{2}\right)} \frac{e^{n_1 z} dz}{(n_1 e^{2z} + n_2)^{\frac{n_1+n_2}{2}}} \quad \dots \quad (10)$$

The 5 per cent. and 1 per cent. points of this distribution have been tabulated by Fisher and are used to test whether these two estimates of the same variance are significantly different.

It may be remarked here that if  $s_1^2$  and  $s_2^2$  are estimates of two different variances  $\sigma_1^2$  and  $\sigma_2^2$ , and  $\zeta = \log \frac{\sigma_1}{\sigma_2}$ , it may be shown in exactly the same way that  $z - \zeta$  has this distribution.

## II. The Structure of the Analysis of Variance and its Use as a Significance Test.

(i) Suppose that we have a random sample of  $N(=rs)$  values from a homogeneous normal population with variance  $\sigma^2$ , and that these values be subdivided into  $s$  classes with  $r$  individuals in each class. Let  $x_{uv}$  denote the  $u$ th individual in the  $v$ th class,  $\bar{x}_{.v}$  the mean of the  $v$ th class,  $\bar{x}_u$  the mean of the  $u$ th individuals in all classes,  $\bar{x}$  the general mean. Then we have the identity

$$S(x_{uv} - \bar{x})^2 = S(\bar{x}_{.v} - \bar{x})^2 + S(\bar{x}_u - \bar{x})^2 + S(x_{uv} - \bar{x}_{.v} - \bar{x}_u + \bar{x})^2 \quad \dots \quad (11)$$

Where the symbol  $S$  is used to denote summation over all the individuals in the sample.

Then, as we have seen,  $\frac{S(x_{uv} - \bar{x})^2}{rs - 1}$  is an unbiased estimate of  $\sigma^2$  based on  $rs - 1$  degrees of freedom, whose distribution in random samples we have already found.

(ii) Now consider  $S(\bar{x}_{.v} - \bar{x})^2$ .

Let  $E(w)$  denote the mathematical expectation of  $w$  or, as we may say, its mean value in all possible samples. Then if  $m$  be the population mean,

$$E(\bar{x}_{.v} - \bar{x})^2 = E \left[ \frac{1}{r} \sum_{u=1}^r (x_{uv} - m) - (\bar{x} - m) \right]^2$$

$$= E \left[ \frac{1}{r^2} \sum_{u=1}^r (x_{uv} - m)^2 - \frac{2(\bar{x} - m)}{r} \sum_{u=1}^r (x_{uv} - m) + (\bar{x} - m)^2 \right].$$

But

$$E(x_{uv} - m)^2 = \sigma^2$$

$$E(x - m)(x' - m) = 0$$

where  $x$  and  $x'$  are two different sample values,

whence 
$$E(\bar{x} - m)(x_{uv} - m) = \frac{\sigma^2}{rs}$$

$$E(\bar{x} - m)^2 = \frac{\sigma^2}{rs}$$

Thus 
$$E(\bar{x}_{.v} - \bar{x})^2 = \frac{\sigma^2}{r} - \frac{2\sigma^2}{rs} + \frac{\sigma^2}{rs}$$

$$= \frac{\sigma^2}{r} \left( \frac{s-1}{s} \right)$$

and 
$$ES(\bar{x}_{.v} - \bar{x})^2 = \sigma^2(s-1) \dots \dots \dots (12)$$

Thus  $\frac{S(\bar{x}_{.v} - \bar{x})^2}{s-1}$  is an unbiased estimate of  $\sigma^2$ .

Now we know that  $x$  is normally distributed, therefore  $\bar{x}_{.v}$ , which merely depends on the sum of a number of  $x$ 's, will also be normally distributed, therefore the distribution of  $\frac{S(\bar{x}_{.v} - \bar{x})^2}{s-1}$  will be given by the previous theory. This quantity is in fact an estimate of  $\sigma^2$  based on  $(s-1)$  degrees of freedom. It is, of course, obvious that there are  $(s-1)$  degrees of freedom because we have  $s$  class means, and our estimate  $\bar{x}$  of the general mean has been made from the sample, by which process one degree of freedom is lost.

(iii) In exactly the same way we may show that  $\frac{S(\bar{x}_u - \bar{x})^2}{r-1}$  is an unbiased estimate of  $\sigma^2$  based on  $(r-1)$  degrees of freedom, whose distribution is given by the previous theory.

(iv) Now consider  $S(x_{uv} - \bar{x}_{.v} - \bar{x}_u + \bar{x})^2$ .

We have 
$$E(x_{uv} - \bar{x}_{.v} - \bar{x}_u + \bar{x})^2$$

$$= E\{(x_{uv} - m) - (\bar{x}_{.v} - m) - (\bar{x}_u - m) + (\bar{x} - m)\}^2$$

$$= E\{(x_{uv} - m)^2 + (\bar{x}_{.v} - m)^2 + (\bar{x}_u - m)^2 + (\bar{x} - m)^2$$

$$- 2(x_{uv} - m)(\bar{x}_{.v} - m) - 2(x_{uv} - m)(\bar{x}_u - m)$$

$$+ 2(x_{uv} - m)(\bar{x} - m) - 2(\bar{x}_{.v} - m)(\bar{x} - m)$$

$$- 2(\bar{x}_u - m)(\bar{x} - m) + 2(\bar{x}_{.v} - m)(\bar{x}_u - m)\}$$

But remembering 
$$E(x_{uv} - m)^2 = \frac{\sigma^2}{rs}$$

and 
$$E(x - m)(x' - m) = 0$$
 as before, we easily find

$$E(\bar{x}_{.v} - m)^2 = \frac{\sigma^2}{r}$$

$$E(\bar{x}_u - m)^2 = \frac{\sigma^2}{s}$$

$$E(\bar{x} - m)^2 = \frac{\sigma^2}{rs}$$

$$E(x_{uv} - m)(\bar{x}_{.v} - m) = \frac{\sigma^2}{r}$$

$$E(x_{uv} - m)(\bar{x}_u - m) = \frac{\sigma^2}{s}$$

$$E(x_{uv} - m)(\bar{x} - m) = \frac{\sigma^2}{rs}$$

$$E(\bar{x}_{.v} - m)(\bar{x} - m) = \frac{\sigma^2}{rs}$$

$$E(\bar{x}_u - m)(\bar{x} - m) = \frac{\sigma^2}{rs}$$

$$E(\bar{x}_{.v} - m)(\bar{x}_u - m) = \frac{\sigma^2}{rs}$$

Whence 
$$E(x_{uv} - \bar{x}_{.v} - \bar{x}_u + \bar{x})^2 = \sigma^2 \left( 1 - \frac{1}{r} - \frac{1}{s} + \frac{1}{rs} \right) \\ = \frac{\sigma^2(r-1)(s-1)}{rs} \quad (13)$$

Therefore  $\frac{ES(x_{uv} - \bar{x}_{.v} - \bar{x}_u + \bar{x})^2}{(r-1)(s-1)}$  is an unbiased estimate of  $\sigma^2$  whose distribution is given by the previous theory; \* for the sums or differences of quantities which are normally distributed are themselves normally distributed.

It is easy to see that there are  $(r-1)(s-1)$  degrees of freedom for the  $rs$  quantities,

$$X_{uv} = x_{uv} - \bar{x}_{.v} - \bar{x}_u + \bar{x} \quad \left. \begin{array}{l} u = 1 \dots r \\ v = 1 \dots s \end{array} \right\}$$

for if these quantities are written down in  $s$  rows with  $r$  in a row thus :

$$\begin{array}{cccccc} X_{11}, & X_{21} & \dots & \dots & \dots & X_{r1} \\ X_{12}, & X_{22} & \dots & \dots & \dots & X_{r2} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ X_{1s}, & X_{2s} & \dots & \dots & \dots & X_{rs} \end{array}$$

it is at once seen that the sums of all the rows and columns are zero. Thus  $(s-1)$  of the numbers in each of the first  $r-1$  columns can be given any values we please and the remaining ones are then

\* The reader should here be referred to "Applications of Student's Distribution" by R. A. Fisher, *Metron*, Vol. V, No. 3, p. 10, 1925, where a general proof is given of a theorem of which this and all similar theorems are particular cases.

determinate. Thus there are only  $(r-1)(s-1)$  independent quantities in the set.

(v) To sum up, we have shown: (a) that the total sum of squares,  $S(x_{uv} - \bar{x})^2$ , may be divided up in accordance with the following scheme:

	Sum of Squares.	Degrees of Freedom.
(1) Between class means ...	$S(\bar{x}_{.v} - \bar{x})^2$	$s - 1$
(2) Between means of corresponding individuals in different classes ...	$S(\bar{x}_{u.} - \bar{x})^2$	$r - 1$
(3) Interaction between (1) and (2) ...	$S(x_{uv} - \bar{x}_{.v} - \bar{x}_{u.} + \bar{x})^2$	$(r-1)(s-1)$
Total ...	$S(x_{uv} - \bar{x})^2$	$rs - 1$

(b) With each of these expressions (1), (2) and (3) may be associated the corresponding number of degrees of freedom. These are always equal to the number of expressions squared, less the number of independent relations between them.

(c) If our sample is a random sample from a homogeneous normal population with variance  $\sigma^2$ , then when each of the expressions (1), (2) and (3) is divided by its corresponding degrees of freedom we obtain an unbiased estimate of  $\sigma^2$ . This estimate will be distributed in random samples in the manner shown in Section I (ii). The ratio "z" of any two such estimates will be distributed in the manner shown in Section I (iii).

(vi) This procedure may be used as a *test of significance* to test whether our sample is a random sample from a homogeneous normal population or not. If any two of our estimates of variance are very unequal, they will give rise to a large value of "z." From the known distribution of "z" we can calculate the probability of such a large value occurring in a random sample from a homogeneous normal population.

If this probability is too small we reject the hypothesis that the sample is a random sample from a homogeneous normal population.

For example, in this particular instance we may regard our  $s$  classes as being  $s$  blocks of land, and corresponding individuals in different classes as being plot yields, one in each of the different blocks, receiving like manurial treatments. The expression (1) is then  $r$  times the sum of the squares of the deviations of the block means from the general mean. The expression (2) is  $s$  times the sum of the squares of the deviations of the treatment means from the general mean. Expression (3) is what has come to be known as "*sum of squares due to error.*"

We may compare (1) and (3) by means of the "z" test. If (1) is significantly larger than (3) as judged by this test, we conclude that the soil is heterogeneous.



If (2) is significantly larger than (3) as judged by the "z" test, we conclude that our manurial treatments are significantly affecting yield.

In either of these two cases the hypothesis that the sample is a random one from a homogeneous normal population is definitely disproved. In actual practice when this hypothesis has been disproved, it is the custom to use the estimate of variance obtained on dividing the sum of squares in expression (3) by the corresponding degrees of freedom as the basis for calculating the standard errors of the treatment means. This process is, in fact, theoretically correct, but it must be noted here that it requires further theoretical justification. We have, once we have established that our sample is not a random one from a homogeneous normal population, to consider very carefully what is the nature of the population from which we are in fact sampling.

(vii) The properties demonstrated in the previous sections may easily be generalized. We might, for instance, suppose that we have  $N = rst$  observed values divided into  $t$  classes. Each of these classes might be divided into  $s$  sub-classes with  $r$  individuals in each.

Let  $x_{uvw}$  be the value of the variate for the  $u$ th individual in the  $v$ th sub-class in the  $w$ th class,  $\bar{x}$  the general mean,  $\bar{x}_{u..}$  the mean of all the  $u$ th individuals,  $\bar{x}_{..v}$  the mean of all the individuals in the  $v$ th sub-classes,  $\bar{x}_{..w}$  the mean of all the individuals in the  $w$ th class,  $\bar{x}_{uv}$  the mean of all the individuals in the  $u$ th class and  $v$ th sub-class, with similar meanings for  $\bar{x}_{.vw}$  and  $\bar{x}_{u.w}$ . Then we can show

$$\begin{aligned}
 S(x_{uvw} - \bar{x})^2 &= S(\bar{x}_{u..} - \bar{x})^2 + S(\bar{x}_{..v} - \bar{x})^2 + S(\bar{x}_{..w} - \bar{x})^2 \\
 &\quad + S(\bar{x}_{u..} - \bar{x}_{u..} - \bar{x}_{..v} + \bar{x})^2 \\
 &\quad + S(\bar{x}_{u.w} - \bar{x}_{u..} - \bar{x}_{..w} + \bar{x})^2 \\
 &\quad + S(\bar{x}_{.vw} - \bar{x}_{..v} - \bar{x}_{..w} + \bar{x})^2 \\
 &\quad + S(x_{uvw} - \bar{x}_{uv} - \bar{x}_{.vw} - \bar{x}_{u.w} \\
 &\quad \quad + \bar{x}_{u..} + \bar{x}_{..v} + \bar{x}_{..w} - \bar{x})^2 \quad \dots \quad (14)
 \end{aligned}$$

the summation being in each case extended over *every individual* in the sample.

It may also be shown that the mathematical expectations of each of the seven terms in the above expression are as follows :

- (1)  $(r - 1)\sigma^2$
- (2)  $(s - 1)\sigma^2$
- (3)  $(t - 1)\sigma^2$
- (4)  $(r - 1)(s - 1)\sigma^2$
- (5)  $(s - 1)(t - 1)\sigma^2$
- (6)  $(t - 1)(r - 1)\sigma^2$
- (7)  $(r - 1)(s - 1)(t - 1)\sigma^2$

The degrees of freedom are in each case the coefficients of  $\sigma^2$ . It is easily shown that their total is  $rst - 1$ , or the number of degrees of freedom appropriate to  $S(x_{uvw} - \bar{x})^2$ .

Any of these seven estimates of variance may be compared with any other by the "z" test, to test the hypothesis whether the sample is a random sample from a homogeneous normal population.

### III. *Estimation in Cases where Heterogeneity has already been Shown.*

We must now return to the point mentioned in Section II (vi). Suppose we have by the application of the significance test shown that our sample cannot be regarded as a random sample from a homogeneous normal population. We have to justify the use of the "error term" in the analysis of variance as the basis of our estimate of the standard errors of the means in which we are interested. (In our example these were the treatment means in an agricultural experiment.)

This involves a careful consideration of the nature of the population from which we must now regard our sample as coming.

We shall start by making the simplest possible hypothesis about this population, namely, that it may be divided into  $s$  groups with  $r$  sub-groups within each group. We may, if we wish, regard the groups as corresponding to blocks of land and the sub-groups as manurial treatments.

Let  $x_{uv}$  be a value of the variate in the  $u$ th sub-group of the  $v$ th group, let  $m_{uv}$  be the mean value of  $x_{uv}$  for all individuals in the population who are in the  $u$ th sub-group of the  $v$ th group.

Then we have  $x_{uv} = m_{uv} + \xi_{uv}$ , where the mean value of  $\xi_{uv}$  over the sub-group is zero. We shall suppose our sample to be composed by taking one individual at random out of each sub-group.

In accordance with our previous notation, we shall use  $m_u$  to denote the mean value in the population of the  $s$  values of  $m_{uv}$  in the  $u$ th sub-groups,  $m_v$  to denote the mean of the  $r$  values of  $m_{uv}$  in the  $v$ th group, and finally  $m$  to denote the population mean.  $\bar{x}_u$ ,  $\bar{x}_v$  and  $\bar{x}$  are as before the corresponding quantities in the sample. We shall suppose that the variance of the individuals in any one "cell" ( $uv$ ) is  $\sigma^2$  and that this is the same for all cells.

Then we have

$$\begin{aligned} E(\bar{x}_u - \bar{x})^2 &= E(m_u - m + \bar{\xi}_u - \bar{\xi})^2 \\ &= (m_u - m)^2 + E(\bar{\xi}_u - \bar{\xi})^2 \end{aligned}$$

since the mean value of the product term in all possible samples is easily seen to be zero. But

$$\begin{aligned}
E(\bar{\xi}_{u.}^2) &= E\frac{1}{s^2}(\xi_{u_1} + \xi_{u_2} + \dots + \xi_{u_r})^2 = \frac{\sigma^2}{s} \\
E(\bar{\xi}_{u.} \bar{\xi}) &= E\frac{1}{rs^2}(\xi_{u_1} + \xi_{u_2} + \dots + \xi_{u_r})S(\xi) = \frac{\sigma^2}{rs} \\
E(\bar{\xi}^2) &= \frac{\sigma^2}{rs} \\
E(\bar{\xi}_{u.} - \bar{\xi})^2 &= \frac{\sigma^2}{s} - \frac{\sigma^2}{rs} = \frac{\sigma^2}{s}\left(\frac{r-1}{r}\right) \\
\therefore ES(\bar{x}_{u.} - \bar{x})^2 &= S(m_{u.} - m)^2 + (r-1)\sigma^2 \quad (14)
\end{aligned}$$

This may be written in the alternative form

$$sE \sum_{u=1}^r (\bar{x}_{u.} - \bar{x})^2 = s \sum_{u=1}^r (m_{u.} - m)^2 + (r-1)\sigma^2. \quad (14 \text{ bis})$$

In precisely the same way we can show

$$ES(\bar{x}_{.v} - \bar{x})^2 = S(m_{.v} - m)^2 + (s-1)\sigma^2. \quad (15)$$

or alternatively

$$rE \sum_{v=1}^s (\bar{x}_{.v} - \bar{x})^2 = r \sum_{v=1}^s (m_{.v} - m)^2 + (s-1)\sigma^2. \quad (15 \text{ bis})$$

The meaning of equations (14) and (15) will become clearer when we have considered the "error" term. We have:—

$$\begin{aligned}
&E(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})^2 \\
&= E(m_{uv} - m_{u.} - m_{.v} + m + \xi_{uv} - \bar{\xi}_{u.} - \bar{\xi}_{.v} + \bar{\xi})^2 \\
&= (m_{uv} - m_{u.} - m_{.v} + m)^2 + E(\xi_{uv} - \bar{\xi}_{u.} - \bar{\xi}_{.v} + \bar{\xi})^2. \quad (16)
\end{aligned}$$

the mean value of the product term in all possible samples being easily shown to vanish as before.

Now

$$\begin{aligned}
&E(\xi_{uv} - \bar{\xi}_{u.} - \bar{\xi}_{.v} + \bar{\xi})^2 \\
&= E(\xi_{uv}^2 + \bar{\xi}_{u.}^2 + \bar{\xi}_{.v}^2 + \bar{\xi}^2 - 2\xi_{uv}\bar{\xi}_{u.} - 2\xi_{uv}\bar{\xi}_{.v} \\
&\quad + 2\xi_{uv}\bar{\xi} + 2\bar{\xi}_{u.}\bar{\xi}_{.v} - 2\bar{\xi}_{u.}\bar{\xi} - 2\bar{\xi}_{.v}\bar{\xi})
\end{aligned}$$

But it is easily shown that

$$\begin{aligned}
E\xi_{uv}^2 &= \sigma^2 & E\xi_{uv}\bar{\xi}_{u.} &= \frac{\sigma^2}{s} \\
E\bar{\xi}_{u.}^2 &= \frac{\sigma^2}{s} & E\xi_{u.}\bar{\xi}_{.v} &= \frac{\sigma^2}{r} \\
E\bar{\xi}_{.v}^2 &= \frac{\sigma^2}{r} & E\xi_{uv}\bar{\xi} &= \frac{\sigma^2}{rs} \\
E\bar{\xi}^2 &= \frac{\sigma^2}{rs} & E\bar{\xi}_{u.}\bar{\xi}_{.v} &= \frac{\sigma^2}{rs} \\
E\bar{\xi}_{u.}\bar{\xi} &= E\bar{\xi}_{.v}\bar{\xi} & &= \frac{\sigma^2}{rs}
\end{aligned}$$

$$\text{Thus} \quad E(\xi_{uv} - \bar{\xi}_{u.} - \bar{\xi}_{.v} + \bar{\xi})^2 = \frac{\sigma^2(r-1)(s-1)}{rs}$$

$$\text{and} \quad ES(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})^2 \\ = S(m_{uv} - m_{u.} - m_{.v} + m)^2 + (r-1)(s-1)\sigma^2 \quad . \quad (17)$$

This is as far as we can get without making a further assumption. We now assume that  $x_{uv}$  is made up of three portions, one of which depends on the group only, another on the sub-group only and the third only on variation within the "cell." In our agricultural example this amounts to supposing that the yield is made up of three portions, one of which depends on the block only, the other on the manurial treatment only, and the third, which is supposed constant for all blocks and treatments, on other causes of variation.

Thus we have on this assumption

$$x_{uv} = t_u + b_v + \xi_{uv}$$

From which it easily follows that if  $\bar{s}\bar{b} = \sum_{v=1}^s b_v$ ,  $r\bar{t} = \sum_{u=1}^r t_u$

$$\left. \begin{aligned} m_{u.} &= t_u + \bar{b} \\ m_{.v} &= \bar{t} + b_v \\ m &= \bar{b} + \bar{t} \\ m_{uv} &= t_u + b_v \end{aligned} \right\}$$

or

$$m_{uv} - m_{u.} - m_{.v} + m = 0.$$

or

$$ES(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})^2 = (r-1)(s-1)\sigma^2 \quad . \quad (18)$$

Thus

$$S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})^2 / (r-1)(s-1)$$

is an unbiased estimate of  $\sigma^2$ , our variance due to "error."\* Its distribution will be given by the previous theory.

The meaning of equation (14) now becomes clear. For we see that our unbiased estimate of  $\frac{S(m_{u.} - m)^2}{r-1}$

$$\text{is} \quad \frac{S(\bar{x}_{u.} - \bar{x})^2}{r-1} - \frac{S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})^2}{(r-1)(s-1)} \quad . \quad (19)$$

In other words, if we again refer to our agricultural example, in order to estimate the variance due to treatments in our population, we must deduct from the item under "treatments" in our "mean square" column the item under "error." In the same way in order to estimate the variance due to blocks in our population we must deduct from the item under "blocks" in the "mean square" column the item under error.

\* This assumes that there is no significant interaction between treatments and blocks, which is the assumption usually made in a randomized block experiment. If there were a significant interaction it would be included in this estimate. The point could be tested by replicating the whole experiment.

The result may be put in an alternative form. Our estimate of

$$\sum_{u=1}^r (m_u - m)^2 / (r - 1)$$

will be

$$\frac{\sum_{u=1}^r (\bar{x}_u - \bar{x})^2}{r - 1} - \frac{\sum_{u=1, v=1}^{r, s} (x_{uv} - \bar{x}_u - \bar{x}_v + \bar{x})^2}{s(r - 1)(s - 1)} \quad (20)$$

Probably the left-hand side of (19) is a more satisfactory definition of "variance due to treatments" than the left-hand side of (20); however, both equations are equivalent, and the reader may take his choice.

The essential point to notice is that once the hypothesis that the sample is a random sample from a homogeneous population has been disproved, while our estimate of the variance due to error remains valid, the other items in the "mean square" column require a correction before they are unbiased estimates of the corresponding variances in the population.

I do not know whether this has been pointed out before. It is not perhaps a very important point in agricultural experiments, since an estimate of error is usually all that is required. But it becomes important as soon as we wish to compare the magnitudes of the various elements of variance.

It also brings out clearly that tests of significance must always be carefully distinguished from methods of estimation. A procedure which is adequate for the former is often inadequate for the latter.

There is one further point. If we wished to fit to our observed values  $x_{uv}$  a function of the form  $X_{uv} = t_u + b_v$  so as to make  $S(x_{uv} - X_{uv})^2$  a minimum, it can be easily shown that  $X_{uv} = \bar{x}_u + \bar{x}_v - \bar{x}$ ; so that our sum of squares due to error is, in fact, the sum of the squares of the residuals, when this method of fitting is adopted.

#### IV. *The Latin Square.*

(i) Since the Latin Square is not obviously included in the previous classification, it will be given special treatment here. As its use has so far been confined to agricultural experiments, agricultural language will from the outset be used.

Suppose we have  $r^2$  plots of land arranged in  $r$  rows and  $r$  columns,  $r$  different manurial treatments occurring on these plots in such a way that each treatment appears once in each column and each row.

Let  $X_{uv}$  be the yield of the plot in the  $u$ th column and  $v$ th row, let  $\bar{x}_u$  be the mean yield of column  $u$ ,  $\bar{x}_v$  the mean yield of row  $v$  and  $\bar{x}$  the mean yield of the plots receiving the same treatment as

Let  $\bar{x}$  be the general mean.

Our fundamental identity here is

$$S(x_{uv} - \bar{x})^2 = S(\bar{x}_{u.} - \bar{x})^2 + S(\bar{x}_{.v} - \bar{x})^2 \\ + S(\bar{x}_t - \bar{x})^2 + S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} - \bar{x}_t + 2\bar{x})^2. \quad (21)$$

$S$  being used as before *strictly* in the sense of summation over *every observation* in the sample. To prove this identity we remember that we have already seen that

$$S(x_{uv} - \bar{x})^2 = S(\bar{x}_{u.} - \bar{x})^2 + S(\bar{x}_{.v} - \bar{x})^2 + S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})^2$$

Here it is only necessary to prove that

$$S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} - \bar{x}_t + 2\bar{x})^2 \\ = S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})^2 - S(\bar{x}_t - \bar{x})^2. \quad (22)$$

The left-hand side of this expression is equal to

$$S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})^2 + S(\bar{x} - \bar{x}_t)^2 \\ + 2S(\bar{x} - \bar{x}_t)(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})$$

Considering the product term we have

$$S\bar{x}(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x}) = 0$$

To evaluate

$$S\bar{x}_t(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})$$

let us sum first over all the plots which receive the  $t$ th treatment.

If these are  $x_{1\alpha}, x_{2\beta}, x_{3\gamma}, \dots, x_{r\xi}$  we obtain

$$S\bar{x}_t(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x}) \\ = \Sigma \frac{1}{r} (x_{1\alpha} + x_{2\beta} + \dots + x_{r\xi}) \\ \times \left\{ \begin{array}{l} x_{1\alpha} - \bar{x}_1 - \bar{x}_{. \alpha} + \bar{x} \\ + x_{2\beta} - \bar{x}_2 - \bar{x}_{. \beta} + \bar{x} \\ + x_{3\gamma} - \bar{x}_3 - \bar{x}_{. \gamma} + \bar{x} \\ + \dots \end{array} \right\}$$

$\Sigma$  denoting summation over all treatments.

This expression is equal to

$$\Sigma \frac{1}{r} (x_{1\alpha} + x_{2\beta} + x_{3\gamma} + \dots)^2 \\ - \Sigma \frac{1}{r} (x_{1\alpha} + x_{2\beta} + \dots)(\bar{x}_1 + \bar{x}_2 + \bar{x}_3 + \dots) \\ - \Sigma \frac{1}{r} (x_{1\alpha} + x_{2\beta} + \dots)(\bar{x}_{. \alpha} + \bar{x}_{. \beta} + \bar{x}_{. \gamma} + \dots) \\ + \Sigma (x_{1\alpha} + x_{2\beta} + \dots)\bar{x}$$

But clearly

$$\begin{aligned}\bar{x}_{1.} + \bar{x}_{2.} + \bar{x}_{3.} + \dots &= r\bar{x} \\ \bar{x}_{.a} + \bar{x}_{.b} + \bar{x}_{.c} + \dots &= r\bar{x} \\ \Sigma \bar{x}(x_{1a} + x_{2b} + x_{3c} + \dots) &= r^2 \bar{x}^2\end{aligned}$$

Thus our expression is equivalent to

$$\begin{aligned}r\Sigma \bar{x}_i^2 - 2r^2 \bar{x}^2 + r^2 \bar{x}^2 \\ = r(\Sigma \bar{x}_i^2 - r\bar{x}^2) = S(\bar{x}_i - \bar{x})^2.\end{aligned}$$

Thus

$$\begin{aligned}S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} - \bar{x}_i + 2\bar{x})^2 \\ = S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} + \bar{x})^2 - S(\bar{x}_i - \bar{x})^2. \quad (23)\end{aligned}$$

and our identity is proved.

(ii) Let us first suppose we have a homogeneous normal population with variance  $\sigma^2$  and that we take a sample of  $r^2$  values and arrange these as in a Latin Square.

Then, as in the previous discussion, we shall easily find

$$\begin{aligned}ES(\bar{x}_{u.} - \bar{x})^2 &= (r-1)\sigma^2 \\ ES(\bar{x}_{.v} - \bar{x})^2 &= (r-1)\sigma^2 \\ ES(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} - \bar{x}_i + 2\bar{x})^2 &= (r-1)(r-2)\sigma^2\end{aligned}$$

It is easily shown that the multipliers of  $\sigma^2$  are in each case the corresponding degrees of freedom, and thus that each sum of squares divided by its corresponding degrees of freedom gives an estimate of variance whose distribution is given by the previous theory. In fact the analysis of variance is as follows:

	Sum of Squares.			Degrees of Freedom.
Columns ... ..	$S(\bar{x}_{u.} - \bar{x})^2$			$(r-1)$
Rows ... ..	$S(\bar{x}_{.v} - \bar{x})^2$			$(r-1)$
Treatments ... ..	$S(\bar{x}_i - \bar{x})^2$			$(r-1)$
Error ... ..	$S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} - \bar{x}_i + 2\bar{x})^2$			$(r-1)(r-2)$
Total ... ..	$S(x_{uv} - \bar{x})^2$			$r^2 - 1$

Here our significance test consists in comparing by the "z" test the estimate of  $\sigma^2$  obtained from the "Treatment" item with that obtained from the "Error" item.

(iii) Once we have rejected the hypothesis that our sample is a random sample from a homogeneous normal population, we have, just as before, to make new assumptions about the nature of the population from which our sample is, in fact, drawn. The simplest way is to suppose—

(a) That the population consists of a set of sub-populations equal in number to the total number of different  $r$  by  $r$  Latin Squares.

(b) That each sub-population consists of  $r^2$  groups, identifiable by a column, row and treatment number, the position of treatments satisfying the Latin Square conditions.

(c) That the sample is formed by selecting a sub-population at random out of all the possible ones, and then selecting one individual, again at random, out of each group.

(d) That an individual yield consists of the sum of four portions due respectively to the column, row and treatment to which it belongs and to other sources of variation (error). It then follows that  $x_{uv} = m_{u.} + m_{.v} + m_t - 2m + \xi_{uv}$ , where the mean value of  $\xi_{uv}$  is zero for any one group.

Here  $m_{u.}$  is the population mean for the  $u$ th column,  $m_{.v}$  for the  $v$ th row,  $m_t$  for the  $t$ th treatment and  $m$  the general mean, and

$$m_{uv} = m_{u.} + m_{.v} + m_t - 2m.$$

We suppose  $\sigma^2$  to be the variance of the yields in any one group.

Then we can show that it is still true that

$$ES(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} - \bar{x}_t + 2\bar{x})^2 = (r-1)(r-2)\sigma^2$$

or that our estimate of error still holds and may therefore be used as a basis for calculating the standard errors of the treatment means.

Further,

$$\begin{aligned} ES(\bar{x}_t - \bar{x})^2 &= ES(m_t - m + \bar{\xi}_t - \bar{\xi})^2 \\ &= S(m_t - m)^2 + ES(\bar{\xi}_t - \bar{\xi})^2 \end{aligned}$$

But

$$\begin{aligned} E(\bar{\xi}_t - \bar{\xi})^2 &= E\bar{\xi}_t^2 - 2E\bar{\xi}_t\bar{\xi} + E\bar{\xi}^2 \\ &= \frac{\sigma^2}{r} - \frac{2\sigma^2}{r^2} + \frac{\sigma^2}{r^2} \\ &= \frac{\sigma^2}{r^2}(r-1) \end{aligned}$$

$$\text{Thus } ES(\bar{\xi}_t - \bar{\xi})^2 = \sigma^2(r-1)$$

$$\text{and } ES(\bar{x}_t - \bar{x})^2 = S(m_t - m)^2 + \sigma^2(r-1) \quad . \quad (24)$$

Therefore our unbiased estimate of  $\frac{S(m_t - m)^2}{r-1}$  will be

$$\frac{S(\bar{x}_t - \bar{x})^2}{r-1} - \frac{S(x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} - \bar{x}_t + 2\bar{x})^2}{(r-1)(r-2)}$$

or, if we prefer, we may say that our unbiased estimate of

$$\frac{\sum_{t=1}^r (m_t - m)^2}{r-1}$$

will be

$$\frac{\sum_{t=1}^r (\bar{x}_t - \bar{x})^2}{r-1} - \frac{\sum_{u=1, v=1}^{r, r} (x_{uv} - \bar{x}_{u.} - \bar{x}_{.v} - \bar{x}_t + 2\bar{x})^2}{r(r-1)(r-2)} \quad . \quad (24 \text{ bis})$$

Thus, the item under "treatments" in the "mean square" column of the analysis is no longer our estimate of the variance due to



"treatments" in the population; an allowance for the error portion has first to be deducted. A similar allowance must be made in estimating the population variance due to columns and rows. Finally, we may remark that if an expression of the form  $X_{uv} = C_u + r_v + T_t$  is fitted by least squares to the data, our sum of squares due to error is, in fact,  $S(x_{uv} - X_{uv})^2$ , i.e. the sum of the squares of the residuals.

### V. Conclusion.

The simpler cases of the analysis of variance have been dealt with. In particular it has been shown why it is correct to divide our "sums of squares" by the "degrees of freedom," and how it is that the additive property holds. That this is a perfectly general result has been indicated rather than proved in Section II (vi). A perfectly general proof that this must always hold good has been given by Fisher.<sup>(1)</sup> This proof puts in an algebraical form the geometrical arguments which he has so often used, and will be found of great interest by all serious students of the subject.

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- (1) R. A. Fisher: "Applications of Student's Distribution," *Metron*, Vol. V, No. 3, 1925, p. 97.
  - (2) R. A. Fisher: "On a Distribution yielding the Error Functions of several Well-known Statistics, *Proceedings of International Math. Congress*, Toronto, 1924.
  - (3) R. A. Fisher: *Statistical Methods for Research Workers*. Third Edition. Oliver and Boyd. This contains an account of the practical applications of the subject, and a number of relevant references to original papers will be found on pp. 276-80.
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## REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Some Recent Researches in the Theory of Statistics and Actuarial Science*. By Professor J. F. Steffensen.  $8\frac{1}{2}'' \times 5\frac{1}{2}''$ . vii + 52 pp. Cambridge: University Press. 1930. Price 5s.

These three Lectures delivered in London University in March, 1930, afford a further example of the extensive work on statistics and actuarial science that is being done in Scandinavia generally and by Professor Steffensen in particular. The first lecture deals with the errors due to neglect of the principle that theoretical assumptions should not contain contradictions, and illustrates what Steffensen has in mind by three examples: the doctrine of the "oldest age," the problem of two mortality tables which produce identical policy values, and "presumptive values" for frequency constants. For the purposes of review we will neglect the second example. As regards the doctrine of the "oldest age," Steffensen complains that mortality tables start with, say, 100,000 persons of age 0 and work in integers, so that the impression is given that when the last of this limited number dies, then an age is reached beyond which life is assumed impossible. If the table was graduated by Makeham's or Gompertz's formula, then it follows that the mortality table assumes that the life table can extend to infinity, though the probability of attaining even age 120 is negligible, and the assumption is no more absurd than the assumption of a possible infinite deviation by the

normal curve of error. On the other hand, there seems no evidence in statistics themselves to prohibit the use of a curve that has a definite termination, while, theoretically, it might be preferable to work on the original "exposed to risk" and "deaths" (or survivors). "Survivors" divided by "exposed to risk" at each age gives the probability of surviving a year ( $p_x$ ), and if each statistical series be graduated by a Pearson Type I curve, then we may reach an indeterminate form for  $p_x$  at the limiting age of the "exposed to risk" curve. While we are not completely convinced by Steffensen's criticism, we agree with him that to tabulate a mere commutation column such as  $l_x$  in integers only leads to results that are unsatisfactory. The most recent tables produced by the Institute and Faculty of Actuaries (Annuities experience) were worked out at the highest ages so as to give a proper progression of annuity values at advanced ages as Steffensen indicates.

We share Steffensen's dislike of "presumptive values." Gauss, Thiele and Tschuprow (amongst others) have given presumptive values for moments, but Gauss only got to the second moment, and Thiele and Tschuprow differ in the fourth. Steffensen's criticism is that contradictory results must follow from the use of such presumptive values, and he adduces evidence in support of his view.

The second lecture gives a mathematical investigation into the limits of error in the calculation of a continuous life annuity (there is a slip in the numerator of the last fraction in the first formula on p. 28, and this necessitates a few subsequent corrections), and discusses, with the help from one general expression, a number of inequalities that arise in actuarial work.

The third lecture deals with frequency functions and investigates under what circumstances a finite number of terms of a series may be looked upon as a frequency function, i.e. a probability, and how the constants may be determined. This attempt at improving the series-forms of frequency functions is interesting, but Steffensen points out that there are still considerable drawbacks, such as possible negative values, over-generality, and the difficulty that the terms of the series are not necessarily arranged in order of magnitude.

The lectures contain many illuminating remarks, such as those with which the first two lectures start; but though these remarks lend themselves to quotation, it will be more pleasant for a reader to come across them in their natural setting.

W. P. E.

2.—*Methods of Correlation Analysis*. By Mordecai Ezekiel, Assistant Chief Economist, Federal Farm Board. 9" × 5½". xiv + 427 pp. New York (Wiley); London (Chapman and Hall), 1930. 22s. 6d.

Considerable progress has recently been made in the field of multiple correlation, and particularly that part which deals with curvilinear regression, so that the standard text-book treatment of this topic is already out of date. Most of these developments are buried in files of technical journals, and the appearance of a comprehensive text-book on correlation, embodying the up-to-date methods and showing their application to practical problems, is a

matter for congratulation, the more so when it comes from the capable hands of Mr. Ezekiel, whose devotion to this branch of statistical science is a matter of common knowledge.

The methods presented in this study, in so far as they constitute an advance over those previously available, represent largely the joint product of a group of young researchers in the Bureau of Agricultural Economics of the United States Department of Agriculture during the past decade. The new methods include (a) the application of the *Doolittle* method to the solution of multiple correlation problems, greatly reducing the labour of obtaining multiple correlation results, and making feasible the use of multiple correlation in actual research work; (b) the development of approximate methods for determining curvilinear multiple correlations, and, more recently, very rapid graphic methods for their determination; (c) the recognition of "joint" correlation, and the gradual development of methods of treating it; and (d) by extensive use in actual investigations, concrete demonstration of the possibilities of these methods in research work. There are numerous worked examples, and the results attained in some instances are remarkable.

These new ideas depend upon a tedious process of successive approximations, which may be worth undertaking when one wishes to establish an hypothesis or when one has in view a table that can be completed once and for all. Operations of this degree of complexity are, however, beyond the compass of the ordinary investigator, who has neither time nor staff to embark upon such fantastic enterprises. There is considerable scope for development in the shape of approximate methods (with graphical aids), the more especially as current economic data do not lend themselves to refined measurements and adjustments. Perhaps some genius will invent a mechanical appliance for solving our difficulties in this direction!

Truly this book is a remarkable performance, both as a storehouse of facts and methods and as a guide to what it is possible to achieve.

L. R. C.

3.—*Introduction to Medical Biometry and Statistics*. By Professor Raymond Pearl. 2nd edition, revised and enlarged. 9"×6". 459 pp. Philadelphia and London: W. B. Saunders Co. 1930. Price 25s. net.

There are not a great number of text-books of statistical methods which make medical problems their primary concern. In 1923 there was certainly ample room for the clear exposition of the essential elementary methods that Professor Pearl gave in the first edition of his *Introduction to Medical Biometry and Statistics*. This proved itself to be a book of considerable value both to those who have to teach and to those who have to learn statistical methods without resort to the laws of algebra. A reprinted edition was issued in 1927, while the present (second edition) has had the advantage of considerable revision and enlargement.

As regards census-taking, death and birth registration, death and birth rates, and other vital statistical indices the book has been

brought up to date. A new life-table nomogram has been introduced and a graphical method of comparing variability. A chapter has been added on the logistic curve of population growth, and the section on the probable error of differences has been expanded. One of the best additions to the book is an extremely cogent section on the collection of statistical data. Only too often statistical analysis is impossible or limited because the data have been badly collected, or because, before collection, the investigator was not clear as to the importance of the presence or absence of particular details. Professor Pearl outlines the fallacies and sources of error very clearly. Fellows of the Society will appreciate the addition of portraits of Mr. Udny Yule and Professor Major Greenwood to the book's galaxy of statistical stars of the first magnitude.

A. B. H.

4.—*Elements of Practical Statistics*. By F. H. Harper, M.S., Ph.D., M.Agr. Bureau of Agricultural Economics, U.S. Department of Agriculture.  $7\frac{3}{4}'' \times 5\frac{1}{4}''$ . xix + 324 pp. New York: Macmillan, 1930. 10s. 6d.

This is a useful manual on statistical method for students not trained in mathematics, and covers the ground as far as the elementary theory of multiple regression.

"A great many students learn the mechanics of analytical methods without understanding the meaning and derivation of terms that are used," and "the text purports to show the logical basis of [statistical] relationships in such a way that the entire field of statistics is seen to be composed of a series of closely associated parts." Customary narratives on method and significance have been avoided in favour of brief and precise statements of the real meaning of terms.

So far as the text is concerned the book may be described as a well-balanced treatise supported by numerous worked-out examples. Unfortunately, some of the diagrams do not stand out. This is due to the grid lines being too heavy, and to Mr. Harper's preference (not shared by the present writer) for the frequency polygon over the histogram form of construction. Incidentally, why does the author not "ground" his frequency polygons in the proper place, namely, halfway up the class interval? Mr. Harper's discussion of the normal frequency curve would bear improvement, for whilst emphasizing the fact that normal distributions seldom occur in economic data, he fails to explain in what respects the concept of "normalcy" is really applicable. The sections on the "ratio method of estimating" and on "par forecasting," included in the chapter on "Estimates and Error," are worth studying. L. R. C.

5.—*Versicherungswesen: System der Versicherungswirtschaft*. By Alfred Manes.  $9'' \times 6''$ . xii + 436 pp. Leipzig und Berlin: Verlag und Druck von B. G. Teubner, 1930. Price Rm. 28.

A new edition of Dr. Alfred Manes' standard book on insurance being required, the author has taken the opportunity of revising it and has extended the work from two volumes to three, of which the

first is now published. He has now included industrial and social forms of insurance among the subjects with which he deals. Throughout he approaches insurance as a branch of economics and the general theory of insurance is discussed in the first volume, presumably leaving the details of the various classes of insurance to be examined in the subsequent volumes. The book is divided into six chapters dealing in order with Definition and nature of Insurance; Development and significance of Insurance; Organization; Management; Politics (including law); Science. The last chapter includes a sketch of the world's literature on the general aspects of insurance.

Dr. Manes has found difficulty in furnishing comparative international statistical information owing to the lack of uniformity in the tabulation of official records, but he has given tables conveying an impression of relative figures, although the exclusion of figures of insurances effected through Lloyd's adds to the difficulties of comparison so far as British insurance interests are concerned.

The book will be found to contain much of interest on the subject, and one is reminded, if a reminder should be considered necessary, over and over again of Professor Manes' extensive knowledge of insurance in many countries.

W. P. E.

6.—*Theories of Population from Raleigh to Arthur Young.* By James Bonar, M.A., LL.D., F.B.A.  $8\frac{1}{2}'' \times 5\frac{1}{2}''$ . 253 pp. London: Allen and Unwin. 1931. 10s. 6d. net.

With the exception of the last two chapters, this volume—which appropriately makes its appearance on the eve of the decennial Census—is a derivative of the series of Newmarch Foundation Lectures delivered by the author during February and March, 1929, at the Galton Laboratory, University College, London.

Beginning with descriptive references to the general cosmographies of the late sixteenth century, and the loosely defined disconnected conceptions of population prevalent at the time of Raleigh, Dr. Bonar traces with admirable brevity and lucidity the development of population studies "from the time when neither Statistics nor Economics nor Demography was clearly conceived, especially in England," to the time when "statistical methods and economic principles had been more or less firmly grasped." The author suggests that although, in the early seventeenth century, the keen mind of Bacon turned to the consideration of questions of policy demanding economic treatment, yet Demography was not among the sciences directly stimulated by the great apostle of experimental philosophy. The economic views of Hobbes, and the rough-and-ready theories of Harrington, who, nevertheless, "really goes beyond the ancients and teaches us a little Demography," bring the story down to a time which is justly regarded as the turning-point of statistical history in this country, introducing Graunt, who first realized the importance of vital statistics, and whose scientific methods of investigation provided a model for work of the kind throughout the world. Then follow references to the contributions of Petty, Halley, Gregory King—perhaps the ablest of seventeenth-

century writers. These are but a few of the great names discussed by Dr. Bonar, who, in the course of his study, ably demonstrates that the men who did most for demography in the seventeenth century were neither statisticians nor economists, but all sorts and conditions of thinking men. Of the tools indispensable to the proper study of vital statistics, *e.g.* a Census, Registration of Births, Deaths, Marriages, etc., the author says, "At the beginning of the seventeenth century there was a mere endeavour after some of these. The end of the century saw the need of all of them acknowledged, and it saw some of them accomplished," so that the eighteenth century dawned to promise of results more substantial and far-reaching.

Derham's *Physico-Theology* professed belief in "the certain rate and proportion in the propagation of mankind," a proper balance of numbers being maintained by Divine intervention, views largely subscribed to by Süssmilch, "the Father of German Demography," who, writing eighty years after Graunt, with more abundant data at his disposal, endeavoured to present "something like a system of principles in the matter of population." Then Hume, "more economist than demographer," Price, who became interested in vital statistics "not from a purely scientific impulse but from philanthropy," and finally Arthur Young, who, arguing that conjectural estimates of population tended to produce mischievous errors, strongly advocated that "an actual enumeration of the people ought to take place." Other important English and continental workers are discussed by Dr. Bonar in the course of his survey, which provides vivid glimpses of the life and work of the leading men of the seventeenth and eighteenth centuries who devoted attention to this field of study.

The author modestly asserts that his book "has no pretensions to being anything more than an introduction to the study of the subjects," yet his competent knowledge and admirable literary equipment enable him to provide his readers with a comprehensive analysis of the contrariety and fluctuation of opinions which characterized the population history of the two centuries under review—to show under what great disadvantages the first speculators in this field of work carried on their studies, and to demonstrate how each generation of these workers benefited from the researches of earlier masters, and were enabled to transmit that knowledge, augmented by fresh acquisitions, to future ages.

Readers will be attracted by the wealth of ordered material presented for their appreciation in this volume, which, omitting nothing essential, compresses within pleasantly readable compass the detailed opinions of the leading contributors of population study during the two centuries preceding that which saw the establishment of the principle of census-taking at decennial intervals in this country.

P. G. E.

7.—*Birth Registration and Birth Statistics in Canada.* By Robert R. Kuczynski. 9"×6". xii+220 pp. Washington, D.C.: The Brookings Institution. 1930. Price 3 dollars (14s. net).

To attempt the writing of a readable history embracing upwards of three centuries of time within the limits of approximately 200 printed pages demands a combination of qualities and abilities of exceptional order; wide knowledge, a sense of fine discrimination and proportion beyond the ordinary, the gift of avoiding hasty generalizations, a scholarly and finished style, are some of the desirable assets which must go to the intellectual make-up of the writer engaged upon so ambitious an undertaking. With some justification, perhaps, readers may be inclined to doubt whether the author of this little book can fairly claim to be possessed of all these accomplishments—may not always find the author's statements and conclusions completely acceptable, and yet may be inclined to agree that, on the whole, he has succeeded in presenting a useful and welcome contribution to students interested in the history of the development of vital registration in various countries.

The unfortunate reviewer of a new work is expected to mount the bench and sit in judgment on it—summarizing its contents for those who have not read but expect an account of it. Let it be said, then, that the author of *Birth Registration in Canada* writes like one who has carefully studied official and other documents which throw light upon the subject he discusses. This bald statement may be interpreted as conveying a flavour of ungenerous appreciation, damning with faint praise a vast amount of research which the preparation of any such work entails. No such intention is either meant or implied, but, having regard to the magnitude of the task in hand, the extended range of time to be covered, and the vicissitudes which have characterized the disturbed history of vital registration in Canada, the book is scarcely the complete memorial one would like to see, for, in so brief a survey, the author is unable to do justice to himself or to his subject; the book is, in fact, a somewhat extended *précis*, and, as such, insufficient attention is devoted to the discussion of certain aspects of the story, with the result that wrong impressions may develop. When the author says (p. 3, Introduction), "Registration was inaugurated by the Catholic clergy," etc., he has, though perhaps unintentionally, over-estimated the influence of the ecclesiastical authorities of the time, at the expense of adequate appreciation of the interest and attention manifested by the French authorities towards all questions relating to the state of the population, for it will be remembered that the Ordinance of Francis I promulgated in France in 1539 prescribed that parish priests should maintain registers of baptisms and burials, and thereafter regulations appeared from time to time for the improved compilation of such registers. The statement (Director's Preface) that "Canada is the only country in the world that has a continuous series of birth records for three centuries" may be accepted only with reservations. Such a statement is mainly true only in so far as the Province of Quebec is concerned, and not for Canada as a whole; the records were, in the main, confined to a



specific religious denomination, and failed to include particulars of persons professing other religious faiths; registers relating to different parishes were by no means equal in value from the point of view of reliability, and so on. Nevertheless, in spite of these and other shortcomings precluding the merit of unqualified praise, the book does provide a general exposition of the fundamental problems and difficulties which marked the years of struggle towards the establishment of dependable registration, and will be useful to those wishing to understand some of the subtler difficulties facing the authorities at various times. A valuable analysis of the birth statistics of various Provinces is supplied, and from these data the author is able to show that the fecundity of French-Canadian women has decreased in recent years, and that the fecundity of British-Canadian women is about as low as that in most other countries of Western civilization, fertility being lowest in Ontario and the Maritime Provinces, where the British element predominates.

The absence of maps indicating the boundaries of "La Nouvelle France" at the beginning of the seventeenth century, the Two Canadas and the Maritime Provinces in 1791, and the gradual extensions in 1867, 1870, 1873, and 1905 is unfortunate, for by their aid the reader would have been enabled to acquire a more intelligible understanding of the story.

P. G. E.

8.—*Seventy Birth Control Clinics*. By Caroline Hadley Robinson.  $8\frac{1}{2} \times 5\frac{1}{2}$ "; xx + 351 pp. Baltimore: William and Wilkins Co., 1930. Price \$4.

This book is the first of a series of publications on the "medical aspects of human fertility" to be issued by the (American) National Committee on Maternal Health. According to an introductory note, we shall be provided, before the end of 1933, with nine successors to it, dealing with the sexual experience of socially normal persons, the unmarried woman, varieties of sex experience, sterilization, sterility, etc., etc.—quite an ambitious little three-years programme. This first volume falls into two parts. The first half gives an account of a survey of birth control clinics actually in existence in Europe and the United States. A useful picture is given of how far the "movement" has advanced, the case procedure adopted (being an American publication methods of birth control, owing to legal requirements, can only be referred to indirectly), and the type of data that is being collected. The author shows quite clearly how fallacious are the deductions that have been drawn from some of this material; for example, on such questions as the variation of mortality with order of birth. On the other hand, at times her own statistics are not without reproach; "the exact estimate of the maximum of possible failure" of the method adopted at the New York clinic is, she says, 16 per cent. This exact estimate is reached after making at least four assumptions concerning 336 unreported cases out of a total of 1,295 cases, none of which assumptions necessarily lead to a maximum.

The second half of the book is devoted to the problem of the

possible effects of birth control on quantity and quality of the population. Some two hundred papers on the population problem are quoted and discussed, sometimes not very critically. The author's belief is that the net growth of population will be essentially unaltered by further birth control, that "men of every time and clime have voluntarily regulated their annual crop of offspring by various elastic devices," and that the great birth decline of the last fifty years is merely an "inevitable response to falling death-rate, the standard of living, the progress of the arts, and many other factors." Birth control is only the means and not the cause of the decline in the birth-rate. As regards quality, Mrs. Robinson is similarly optimistic; she does not believe that birth control is a dysgenic influence. The effect of the clinics is more likely to be in the direction of diminishing rather than increasing the difference between the class birth-rates—especially when the net increase is measured by taking count not only of the birth-rate but of the survival rate, marriage rate, and age at parenthood.

A. B. H.

9.—*The Theory and Principles of Central Banking.* By Wm. A. Shaw, Litt.D. 9" x 6"; xii + 249 pp. London: Pitman, 1930. Price 12s. 6d.

The dust cover of this book speaks of it as a "text-book of advanced banking." That it assuredly is not. Dr. Shaw's views on certain fundamental aspects of economics and of banking-theory run counter to all recognized teaching, and though heterodoxy fulfils a certain function in any science it is not a basis for a general text-book. Nor is Dr. Shaw the ideal exponent of revolutionary doctrine. His explanations often lack clearness, he often fails to deal with questions that obviously require an answer, and he is often petulant when he would more wisely be persuasive. Such phrases as "the currency faddists who believe in inflation," the "shibboleth of gold economy," the "obsessions of the official mind" in maintaining the maximum limit on the currency note issue, do not induce the most receptive frame of mind in the reader.

In the first chapter, on the Central Bank as an Issuer of Currency, Dr. Shaw propounds the view that the Treasury note issue before it was amalgamated with the Bank of England issue was the perfect currency, "issued automatically, retired automatically, self-regulating, never redundant, never deficient, neutral in its effects on prices but rising equal to any strain upon it; guaranteed against debasement by the State which issues it, and incapable of debasement by the community which purchases and uses it." There has never, so Dr. Shaw believes, been any other perfect automatic currency, but unfortunately he never begins to explain what was the fundamental difference between the Treasury note and other war-time issues, nor apparently has it occurred to him that the fall in sterling in terms of dollars after the war was in fact a sign of the depreciation of this undepreciable currency. The argument Dr. Shaw uses to substantiate his theory is that the increased issues of

the Treasury note followed and did not cause the rise in prices. He never adequately deals with the generally accepted view that the existence of a virtually inconvertible and unlimited note issue to bolster up the currency made possible a degree of Government borrowing that, at least partially, brought about the rise in prices.

Dr. Shaw, as will be gathered from the above, is no believer in the quantity theory of money. Money, he maintains, is not a value but only a function, and cannot therefore form the denominator of a fraction as in the statement "price level =  $\frac{\text{goods}}{\text{money}}$ ." The reader

is left with the impression that Dr. Shaw is too impatient with the crudity of this over-simplified method of expression, as applied to a highly complicated economic structure, to recognize that it was never intended as a quantitative answer to a numerical equation, but rather as a symbol of an underlying force. His alternative theory is far from clear. Price he describes as the "expression of the countless ratios of goods to goods." But this clearly gets one no further. Something must determine whether these ratios shall be expressed in the form of 1, 2, 3, or 2, 4, 6, and Dr. Shaw makes no attempt to explain what this is. In other words, he produces no explanation of changes in the general level of prices.

Disbelieving as he does in the quantity theory of money and finding in the Treasury note issue a perfect automatic currency, Dr. Shaw comes logically to the conclusion that the Central Bank is not needed as the Issuer of Currency and cannot be the Controller of a currency which conforms to his ideals.

Dr. Shaw would also withdraw from the Central Bank certain other important functions. He considers that the Central Bank should not undertake the rediscounting of bills where there is a developed money market. The market should be capable of bringing funds and bills together, and if recourse to the Central Bank is needed, something is amiss. He considers that the machinery should be so altered that the periodical stringency such as comes about from the calling in of funds by the Joint Stock Banks, for the purpose of producing a good balance sheet, should be prevented. As far as the more catastrophic periods of stringency are concerned, these, he states, are due to bad banking, "and the most salutary punishment for bad banking is—bankruptcy." It is apparently more important to mete out punishment to an incompetent banker than to save the country from the disasters that may follow the bankruptcy of a financial firm. Dr. Shaw's alternative to rediscounting by the Central Bank is simple. Remove the limit to the issue of notes and authorize the Joint Stock Banks as by right to purchase more notes by the deposit of securities. This, apparently, does not in Dr. Shaw's view involve inflation; on the other hand, he considers that "a rediscount system which operates by means of currency issue from a Central Bank is the most direct form of inflation conceivable." It is difficult to reconcile these two views.

Having deprived the Central Bank of its power to control currency and of its right to rediscount, Dr. Shaw then proceeds to take

from it the right to influence the rate of interest for internal loans and discount. This should be, he considers, entirely determined by internal conditions and should be completely cut off from any matter connected with the Foreign Exchanges. He would like to see the bank rate for loans determined by a directorate representing all the commercial banks, whilst the Central Bank would be relegated to controlling the foreign exchanges. How this could be done without influencing internal prices through the bank rate is not defined.

Finally, Dr. Shaw deals with the Government's position in relation to the Central Bank. He has some forcible things to say on Government borrowing and on Government influence over the Central Bank. His views on these matters will arouse more general agreement than those expressed in other chapters, though he minimizes the difference between an officially recognized but independent bank, such as the Bank of England, and a true State-controlled bank.

The theories in this book are illustrated primarily by references to the workings of the Bank of England and the Federal Reserve System. Though there is little that is not generally known to students of the two systems, some of the descriptive and historical matter is interesting. It is, however, surprising to find someone of Dr. Shaw's knowledge stating that the Italian note issue is still in the hands of three Banks of Issue.

W. A. E.

10.—*Joint-Stock Banking in Germany: A Study of the German Credit Banks before and after the War.* By P. Barrett Whale, B.Sc.(Econ.), M.Com., Sir Ernest Cassel Lecturer in Commerce in the University of London. 8½" × 5½". viii + 369 pp. London: Macmillan & Co., 1930. Price 16s.

Mr. Barrett Whale's book on Joint-Stock Banking in Germany has come at an opportune moment. The relationship between the banks and industrial undertakings in Great Britain has of recent years come much under discussion and the time was ripe for a detailed account of the workings of the banks in a country where this relationship is very different. Not that Mr. Whale makes any attempt to point a moral or to use his knowledge of foreign conditions either in defence or in criticism of the English system; nevertheless, his clear and well-balanced description of banking in Germany has its value for those who are interested in the developments of our own methods as well as for those who wish to acquire a wider knowledge of German conditions.

To arrive at a clear understanding of the German credit banks it is necessary to realize that they were founded with the definite aim of promoting industrial development at a time when industry was suffering from a lack of capital. The organization for directing capital into the channels where it was needed was admittedly inadequate, and the object of the credit banks was to fill this gap. Contrary, however, to a widely held belief in this country, direct participation in industrial undertakings has not been, as Mr. Whale

points out, a part of the permanent policy of the banks. If at times they have been forced into this situation it has for the most part been due to temporary economic conditions, such as the aftermath of a crisis, or to their inability to dispose of an issue of shares. The latter situation is liable to occur owing to the part played by the banks in the promotion of new companies; Mr. Whale in Chapter II gives a clear and suggestive account of the methods adopted and the results of certain requirements of the German law in this respect.

Though company promoting was the primary object of the banks, their sphere of work steadily developed. Mr. Whale sums it up as follows: "In addition to the business of an English Joint Stock Bank, it included now the functions which we regard as proper to company promoters, issuing houses, underwriters, discounting and accepting houses and stockbrokers." The extent to which deposit and current account business has come to the forefront of the banks' activities has, as their history shows, varied for the most part inversely with the general trade activity of the country. In times of depression, when there was little demand for the issue of new capital, the German credit banks, in the scope of their activities, have, perforce, approached most nearly to the English Joint Stock Banks. The term current account has not, however, the same connotation in Germany as in this country, and covers a wider range of debit and credit transactions between the bank and the customer. Mr. Whale points out that the average German firm has always depended to a remarkable degree upon obtaining current account advances even for such purposes as the extension of its permanent equipment. It is in the current account relationship rather than the act of promotion that the close connection between the German bank and its customers has its inception. It is a matter of common knowledge that this connection is closer in Germany and that the bank can exercise greater control over an industrial firm than is usually the case here. Mr. Whale in his second chapter, on the Credit Banks and Industry, gives a detailed description of how this influence is obtained. It is not merely a matter of laying down conditions before the banks will grant credit. They have also other methods. It is common for them, for example, to secure voting rights at the General Meeting by the granting of proxies by other of their customers or by the temporary purchase or loan of shares. Or, again, they may obtain representation on the Board of Supervisors, but this, as is made clear, is a lesser thing than would be representation on an English Board of Directors.

It has often been alleged that the banks utilized their powers over industrial firms to secure the formation of trusts and cartels. Mr. Whale considers, however, that they were not in a position to have taken the initiative in this respect, however much they may have encouraged the movement.

The third chapter of the book deals with the banks and foreign trade. The general methods adopted were similar to those employed by English banks, except that the German banks were willing to give longer credit, and, though this involved obvious risks, in

Mr. Whale's opinion "as a policy applied to the trade of a country which came late into the world's markets it seems to have justified itself by its results." There was, however, one respect in which the banks were unsuccessful in their foreign trade policy, as they made it their definite aim to substitute the mark for sterling as the basis of overseas accounts. Mr. Whale gives an interesting survey of how far they were right in their view that the position of London as an intermediary involved a real tax on Germany's foreign trade. His general conclusion is that it is doubtful whether there was any real loss involved.

In the fourth chapter Mr. Whale deals with the banks and the money market. To readers accustomed to English methods, a striking feature of German practice is the extent of the dealings of the banks on the Bourse on behalf of their customers, their transactions being carried out to a considerable extent through their own representatives without the intermediary of a stock-broker. This practice, though financially satisfactory to the bank, roused much criticism. More fundamental was the criticism that the banks worked with an inadequate margin of cash. Mr. Whale deals at some length with this matter, as its importance deserves, though he is here traversing ground which is probably more familiar to English students than much of his other material. It is generally recognized that both in this respect and with regard to the development of substitutes for cash payment the German banks compared unfavourably with the English Joint Stock Banks.

The final chapter of the first part of the book deals with the business of the banks as a whole. As a basis for his survey Mr. Whale gives a detailed analysis of a typical balance sheet. Many readers will find this analysis invaluable, as it gives the exact implications of the various terms used—implications which cannot always be realized from the mere translation of the words. There are also some interesting comparisons between certain of the leading German banks and the great English Joint Stock Banks with regard to such matters as cash reserves, the relation of investments to other assets and the extent to which the banks rely on their own capital for working funds.

The second part of the book deals with the credit banks during and after the war. The tale of inflation and currency collapse in Germany has often been told, and much of the material in these chapters is very generally familiar, but the position of the banks to-day could not be appreciated without an examination of the effects of war and post-war finance on them. A comparison of recent balance sheets with those of the pre-war period shows certain well-defined changes. There is, as Mr. Whale points out, a striking decline in the relative size of the amounts appearing under the headings Own Securities and Syndicate Participations. This suggests a revolution in the business of the banks, bringing them more into the category of pure deposit banks. The fact is, however, that though the banks have again participated in the issue business, the securities have been more rapidly passed on to the public, which

implies greater caution in the taking over of securities by the banks. Outstanding acceptances are also of less importance than in the earlier period, due primarily to a falling off in trade acceptances which has been brought about by the present condition of German trade and the loss of the London branches of the credit banks. Owing to a decline in other forms of liabilities, deposit and current account balances are now of greater relative importance, but the cash reserves are proportionately lower even than they were before the war. To some extent this is counteracted by an increase in balances abroad, which in effect are partly a reserve against deposits owed to foreigners; the latter now account for a considerable part of deposit accounts as a result of foreign loans.

On the side of organization, recent years have also seen certain important changes. The Berlin banks have increased their importance in the banking world, and in Germany as in this country there have been notable amalgamations. The position of the credit banks as a whole in the financial organization of the country is also being modified by the growth of various forms of public and communal banks, which Mr. Whale describes in some detail. There has also been a marked increase in the importance of certain private banking firms, due in part to the more conservative attitude the credit banks are taking in finance.

In his concluding survey Mr. Whale raises the interesting question whether the credit banks, which largely control the supply of funds, may not be tempted to favour capital developments unduly for the sake of the profits on the issuing transactions and with a view to extending their future business, and consequently tend to produce excessive permanent investment at the expense of liquid resources. In other words, is the German system likely to cause temporary trade booms and accentuate industrial fluctuations? Mr. Whale's conclusion is that "the German banks were largely responsible both for Germany's rapid advance in industry and for the amplitude of her trade movements, and that they could hardly have induced the one without the other." On the whole he considers that the integration of function which is characteristic of the German bank makes it easier to maintain a proper balance between the various uses for the available resources. These questions are certainly controversial and there is likely to be a divergence of opinion on them, but Mr. Whale's book gives a clear and comprehensive survey of the facts for those who wish to study the problem and form their own conclusions.

W. A. E.

11.—*The Royal Commission on Transport; Final Report.* The Co-ordination and Development of Transport. 9½" × 6¼". 244 pp. Cmd. 3751. London: H.M. Stationery Office, 1931. 4s. net.

In their Final Report the Commissioners are not very happy in dealing with "co-ordination." Some desired a form of nationalization to secure that purpose; others preferred to rely on "the play of economic forces," and so their deliberations on this great topic end in two recommendations:—(1) that road hauliers should be

licensed, and (2) that a permanent Advisory Council on Transport should be appointed to study transport problems.

The Report deals at some length with the relation between railways and road transport; it suggests that co-operation is more desirable than a competition which threatens both parties with financial disaster. The whole cost of railway workings is known, being available in the accounts of the railway companies. In order to compare their services to the country with those offered by rival forms of transport one needs a similar analysis of the cost of working trams, motor omnibuses, and motor lorries, *i.e.* all the costs incidental to the running of these vehicles, including the repair, widening, and policing of the roads. The total such cost is not known, and yet it is not possible to say which development is most in the national interest until we know the whole cost of the different services. A road concern may quote a rate or fare lower than that quoted by a railway company, but it is not really cheaper if the road concern can only make its low quotation because it is allowed to throw a large part of its running costs on the rate-payer.

The Commissioners reckon the cost of our roads at £60 million a year, of which two-thirds is paid by the rate-payer, and one-third by the owners of motor vehicles. They would reverse this ratio, but only by taking away from the Exchequer about £20 million now appropriated from the taxation of motor vehicles and petrol. They report strongly against "new arterial roads" and would increase drastically the licence duties payable for heavy commercial vehicles. Indeed, they would discourage the use of vehicles weighing more than four tons unladen, and would prohibit those weighing more than nine or ten tons. On the question whether road transport pays its fair share or is a subsidized industry, the Commissioners could not reach a definite conclusion. The present taxation on commercial vehicles is full of anomalies, some of which would be removed if the recommendations of the Royal Commission are adopted; but a way of avoiding increased licence duties will be available so long as the motor-owner is allowed to transfer the weight from the lorry or tractor to trailers, three of which may be drawn on payment of £6 a year. Evidently the Commissioners think that the road vehicle is now carrying traffic which would better be carried by the railways, for they say, "It is not in the national interest to encourage further diversion of heavy goods traffic from the railways to the roads."

Trams seem to the Royal Commission, "if not an obsolete form of transport, at any rate in a state of obsolescence." Canals differ so much from one another that no general statement can be made about them; but many of the canals which were made in pre-railway days ought to be scrapped.

Little is said about harbours and docks. In general the Report favours a public trust as the best kind of authority, but it would retain most of the railway-owned docks and harbours in their present ownership. Coast-wise shipping and the smaller ports have declined in recent years, doubtless because railways and roads give the



speedier transport demanded by modern business; the Commissioners can only suggest that the ports should be improved, and they do not say who should find the money.

J. E. A.

12.—*The Industrial Development of Birmingham and the Black Country, 1860–1927.* By G. C. Allen, M.Com., Ph.D. 8½" × 5½". xxiii + 479 pp. London: Allen and Unwin, 1929. Price 25s.

About five years ago Messrs. Cadbury Brothers, Ltd., placed funds at the disposal of the University of Birmingham with a request that the Faculty of Commerce should undertake a survey of the industrial development of Birmingham and District during the last half-century. The University appointed Mr. Allen to conduct the survey, and the book under review contains the results of his labours. In view of the close industrial relation that Birmingham has had with the Black Country, the area covered by the survey includes that region.

In a chapter sketching the economic progress of the area before 1860, it is shown that, in the sixteenth century, nails, saddlers' ironmongery, and cutting tools were made in Birmingham and locks at Wolverhampton and Willenhall, and coal was mined and iron smelted in the Black Country. The rise to importance of the Black Country up to the first half of the nineteenth century is easily accounted for by the presence of coal and iron ore, but the causes of the development of Birmingham have not been so clear. Mr. Allen believes that the more important forces which created the town were (a) the increased demand for small finished-metal products which had to be satisfied by a place near the supplies of raw materials and with a tradition of skilled metal working, (b) the fact that Birmingham was not a corporate town and so permitted freedom of enterprise and attracted the "vigorous dissenters," and (c) it had a plentiful supply of good drinking water.

Mr. Allen proceeds to a detailed review of the industries of the district as they existed in 1860, and goes on to describe the changes that took place between that year and 1886, a year which may be taken to mark the end of the iron age and of the period of general depression of industries in this country which began in 1876. A description follows of the establishment of new industries and of changes in mechanical equipment and in the scale of manufactures during the period 1887–1914. The volume concludes with a statement of the position during the war and in post-war years up to 1927.

When reading this book one is struck by the remarkable adaptability shown by the industrial population of Birmingham and District. The brass-workers, for example, turned from the making of cast brass fittings to stamped electric light fittings and from cased tubes for bedsteads to parts for shop-fittings as the markets changed. The Walsall saddlers, too, when faced with the declining demand for horse saddles, began to supply the new market which arose for cycle saddles and ladies' hand-bags.

Statistical tables in the text and in an appendix show, for various

years, the numbers of persons engaged in different industries, the output of minerals, etc. The Census figures for Warwickshire, Staffordshire, and Worcestershire show that the numbers of persons in the brass and copper trades increased steadily from about 11,000 in 1861 to 32,000 in 1911, while nailmakers declined from about 19,000 to 3,000. The cycle trade, which became important in the 'eighties, and the motor-car trade, which began in the 'nineties, were peculiarly suited for the exercise of the kind of skill and technical knowledge possessed by the workers in Birmingham and the neighbourhood, and these were not slow to seize the opportunities thus afforded. The Census figures show 1,700 persons in the cycle trade in the district in 1881. By 1911 the number had increased to 22,500, and for that year 16,800 are shown as engaged in the motor trade. Tables on pp. 410-12 showing, for the United Kingdom, the numbers of insured persons, production, and exports, as illustrations of the advance or decline of certain Midland trades are of somewhat questionable advantage. In the case of the rubber, constructional engineering, and paint, colour, and varnish trades, for instance, the increases shown, while true of the United Kingdom, may not represent, even approximately, the position in the Midlands.

The book will be of particular interest to those who have any connection with the district to which it relates. It also has a wider interest in that it gives a full account of the various stages in the change-over from small workshops and small hand-worked forges to large concerns with many departments and hundreds of workers. Such changes, though strikingly in evidence in Birmingham and district, were also taking place in other industrial areas. J. W. V.

13.—*Problems of the Japanese Exchange, 1914-26.* By Junnosuke Inouye. 8½" × 5½". xxii + 263 pp. London: Macmillan & Co., 1931. 10s. 6d.

*Japan's Economic Position: the Progress of Industrialization.* By John E. Orchard. 9¼" × 6". xvi + 504 pp. New York and London: McGraw-Hill Publishing Co., 1930. 25s.

*Food Supply and Raw Materials in Japan. An Index of the Physical Volume of Production of Food-stuffs, Industrial Crops, and Minerals, 1894-1927.* By E. F. Penrose. 9¼" × 6¼". 75 pp. Chicago: University Press. London: Cambridge University Press, 1930. 9s.

The first of these three volumes is a translation of five lectures delivered in 1926 by Mr. Inouye at the School of Economics in the University of Kyoto. In them he gave to his students a lucid explanation of the system of international exchanges, while he provided a wider public with an interesting exposition of the financial problems which confronted Japan between 1914 and 1926, twelve years which, in the author's words, "saw the finances of the country at the crest of prosperity and in the slough of despond."

With the exception of the war years, the almost invariable feature of the international trade of Japan has been an annual excess of imports which, by the end of 1913, had so seriously strained the

financial position that the prospect was being faced of contracting further foreign loans in order to pay the interest on borrowed money. The war changed all this, and the author estimates that, whereas in 1914 Japan was a debtor country to the extent of Yen 1,100,000,000, in 1920 the world owed her Yen 2,700,000,000.\* Since the Armistice, however, one year of excess of imports has succeeded another, and in 1926 conditions were far worse than anything known before the war. Necessity forced Japan to change her methods of financing her foreign trade, and the years 1918-23 saw the introduction of Bank acceptances and Stamped Bills. The latter are copies of export bills, the originals of which have been handed to the Bank of Japan to be sent abroad for collection, the copies being stamped "Bank of Japan," thus carrying the Bank's guarantee and making them readily discountable in the home market, and avoiding the constant over-supply of money in the Japanese money market which formerly occurred.

Japan's difficulties were, of course, greatly increased by the terrible earthquake of 1923, when the total loss of property was estimated at over Yen 10,000,000,000. Imports had to be increased in order to repair the damage, while exports were perforce diminished, and the excess of imports at the end of 1923 was Yen 550,000,000, whereas the available foreign balances had fallen to Yen 200,000,000. There was still Yen 1,100,000,000 gold in the Bank of Japan, but it was thought unwise to lift the embargo on the export of gold, and foreign loans for Yen 550,000,000 were raised abroad.

In 1926, Mr. Inouye, who had been President of the Yokohama Specie Bank and Governor of the Bank of Japan, was, as a banker, advocating the removal of the gold embargo, a policy which, as Minister of Finance, he carried out in 1929, but in these lectures he pointed to the disagreeable consequences which had followed a similar policy in England (attributing the coal strike of 1926 largely to this cause), and warned Japan that similar effects would follow in Japan. He foretold that the population would increase, that food supply would be insufficient, that imports would continue to exceed exports, and that Japan's tariffs, always high compared with those of other countries, would become an intolerable burden on the consumer. He held that it would not be possible to effect any rapid increase in exports or to reduce imports and, that for her salvation, Japan would have to attract more foreign capital and to increase her invisible exports by enlarging her share of the ocean-carrying trade of the world.

Mr. Inouye says in conclusion that "the industries of the country receive a form of protection which is as universal as it is indiscriminate and which leads to nowhere." He suggests that protection should be concentrated on the shipbuilding industry by putting a stiff duty on the imports of old tonnage, for which he says his country has hitherto been the dumping-ground of the world, and he affirms his belief that Japan can use her maritime transport trade and her shipbuilding industry to put the country on its feet.

\* 1 yen = 24.58 pence.

Mr. Orchard's book is a comprehensive study of the Industrial Revolution of Japan and the problems which confront her to-day. He considers that the "pressure of a rapidly increasing population is the most fundamental problem of modern Japan. It underlies most of the country's perplexing difficulties. It explains the efforts that are being made to improve agriculture and reclaim waste lands and to develop manufacturing and export trade. It is the basis of Japan's foreign policy. It has become an important issue in internal politics, effective in the making and unmaking of Cabinets. It has caught the attention of the public, and in the Press and periodicals it is being discussed by economists and publicists more widely, probably, than any other subject. To understand the present-day economic condition of Japan the full significance of the population problem must be appreciated." For two centuries prior to 1860 the population of Japan remained stationary. Since 1860 it has doubled, and is now increasing at the rate of about 900,000 per year. Such an increase requires, says Mr. Orchard, an annual addition of about 133,000 acres of rice-growing land, but during the last twenty years the annual addition has been only 25,000 to 35,000 acres, and Japan is now importing at least 10 per cent. of her food requirements. On the whole, her emigration policy has been a failure and her reclamation of waste land has hitherto given small results, but, on the other hand, the improvement in agricultural methods has been considerable. Since 1880 there has been an increase of 88 per cent. in the production of rice, three-fourths of which is attributed to a higher yield per acre.

Mr. Orchard considers birth control is becoming a real issue in Japan, and that, whereas a few years ago discussion was suppressed by the police as vigorously as that of Communism is to-day, it is now openly debated and considered by many the only possible solution of Japan's population problem. The view of the Government is also rapidly changing, and the author predicts that within a few years positive checks on population will be advocated and actively encouraged by the State.

Mr. Orchard has much of interest to say about the level of wages in Japan, the efficiency of labour and the development of a labour movement. There is still a strain of paternalism running through all Japanese industry, which accounts for the feudal character of Japanese labour, the dormitory system, food and rent subsidies, semi-annual bonuses, discharge allowances, etc. It is generally thought that Japan has a great advantage over Western countries in her supply of cheap labour and in long working hours. The author holds that, although her labour resources are abundant, labour for industrial purposes is scarce and unskilled, and that its cheapness is open to question, taking its relative inefficiency into account. Also, in addition to direct wages, labour cost is increased by the large charges which must be added for board, lodging, recruiting, etc. In discussing the cotton trade the author points out that "seven times as many workers crowd into a Japanese weaving shed as into an American mill of the same number of looms. That

condition in itself leads to inefficiency." This statement, however, must be based on a comparison of an American mill with automatic looms and a Japanese mill with ordinary looms, and the comparison would not hold good to the same extent between Lancashire and Japan.

The organization of labour is only in its initial stages in Japan. The grant of universal suffrage in 1926 (81 per cent. of the voters cast their vote in the elections of 1928) will lead more and more to the extension of the labour movement, and there is now an agitation for women's franchise and for the lowering of the age limit for all voters. In Japan there is as yet no legal recognition of labour's right to organize into unions, but *de facto* recognition is now given in many ways and the question of legal recognition comes up at every session of the Diet.

Mr. Orchard has written a very useful and interesting book, and the pleasure in reading it is enhanced by the excellent type and paper.

Mr. Penrose devotes three-fifths of his little book to tables and charts, much of the matter in which will appeal only to local students of Japanese problems. The main facts which emerge will, however, be of interest to a wider public. In his view, which appears to conflict somewhat with that of Mr. Orchard, during the years 1907 to 1927 the production of food in Japan more than kept pace with the increase in her population, while, during the same period, the importation of food increased fourfold, and amounted in 1927 to about 20 per cent. of the total food consumption. He thinks, however, that the time is coming when Japan will begin seriously to feel the pressure of population on food supplies, and that she can no longer afford protective tariffs. He therefore welcomes the formation of the Japan Federation of Liberty of Trading Association, an organization which, however, he says, contains "members who are only agreed as a whole on the necessity of freer trade, and many of whom are by no means complete Free Traders."

Mr. Penrose agrees with Mr. Orchard as to the importance of birth control in Japan, where the birth-rate is 34 per mille, and he concludes by saying that the "official attitude is becoming far more reasonable to the whole subject," and by predicting "that Japan's birth-rate will pass through similar, though more belated, changes to those experienced in Western countries."

B. E.

14.—*Problems of the Pacific*, 1929. Proceedings of the Third Conference of the Institute of Pacific Relations, Nara and Kyoto, Japan, October 23 to November 9, 1929. Edited by J. B. Condliffe, D.Sc. 9½" × 6½". xv+697 pp. University of Chicago Press, Chicago, Illinois, 1930. Price 22s. 6d.

The Institute of Pacific Relations is an organization the object of which is to study the conditions of the various Pacific peoples with a view to the improvement of their mutual relations. Its membership is composed of National Councils, apparently voluntarily

formed, from among which representatives are chosen for the government of the Institute. At present there are National Councils for Great Britain, Japan, United States, China, Australia, Canada, and New Zealand. The Institute functions by means of a monthly journal, by Conferences, and by Reports, Memoranda, and Documents either specially prepared for the Conferences or for the general consideration of the Institute. The Institute is not concerned with propaganda or the formation or support of policies, and at its Conferences no resolutions are adopted nor are any lines of action initiated. The result of the Conferences and publications of the Institute is therefore chiefly to ventilate considered opinions based on a study of the political and social questions arising or likely to arise among the peoples and countries of the Pacific area. The large volume noted above deals with the third of the Institute's Conferences and contains fifteen of the documents prepared for the meeting and a summary by Dr. Condliffe, extending to 240 pages, of the discussions that took place. The documents, which are but a small fraction of the total number of those presented for discussion, deal almost entirely with the affairs of China, five of them being concerned with Manchurian questions. The most interesting are probably the account of China's cotton industry, and the history of the International Settlement at Shanghai and the problems connected therewith. Both the summary of Dr. Condliffe, which would have been more informing if it had been more concise, and the printed memoranda suffer from being a good deal "in the air," but this is a consequence of the nature of the Institute, and one feels that after all only individual and not representative opinions are being put forward. Consequently, to those not expert in Pacific questions it is difficult to judge what weight is to be attached to them. Obviously, however, the collection of such a mass of information and the free and frank discussion in connection therewith by competent authorities must be of great value to those whose task it is or will be to deal practically with Pacific affairs.

W. A. B.

#### 15.—Other New Publications.

*Bolling (Cunliffe L.). Commercial Management: a Handbook of Modern Business Practice.* 2nd ed.  $8\frac{1}{4}'' \times 5\frac{1}{4}''$ . 424 pp. London, etc.: Pitman, 1930. 10s. 6d. net.

[This is the second edition of a work described in the preface as "of a practical rather than theoretical nature written by a business man primarily for business men." As the title suggests, it is intended for those concerned in or aspiring to the task of management, and the first and last chapters are respectively devoted to the functions and scope of management in modern business and to the commercial manager's training. The author states, or, as he puts it, admits, that he set out "to deal concisely with a wide range of subjects rather than . . . exhaustively with a few subjects," and the other twenty-two chapters are devoted each to one of the various departments which managers might be called on to organize or supervise: sales, publicity, retailing, exporting, works organization, factory equipment, storage, labour,

costing, company finance, and so on. The information is in the form of practical instruction and explanation and is given for the most part in short, rather peremptory, sentences and paragraphs. There are many illustrations of apparatus in the shape of standard forms and record sheets of various kinds, and the reader is assisted by marginal subheadings throughout the book, as well as by a very detailed index.]

Canada: 1931. *An Official Handbook of Present Conditions and Recent Progress.*  $8\frac{1}{2}'' \times 5\frac{1}{2}''$ . 199 pp. Ottawa: Dominion Bureau of Statistics, 1931. 25 cents.

[Mr. H. H. Stevens, Minister of Trade and Commerce, says in the foreword to this Handbook: "During the existing world-wide depression, Canadians, though less affected by the slump than the peoples of many other countries, should strenuously and earnestly devote themselves to the study of the economic conditions of the Dominion, with a view of co-operating in the restoration of prosperity. The present popularized analysis of the current economic conditions of Canada at the threshold of the New Year is accordingly presented for their consideration and guidance." The first chapters deal with the geography and climate of Canada, its constitution and government, population, and natural resources. Then follow chapters on various industries and manufactures, on trade, transportation, public finance, labour, and education. The Handbook is well illustrated, contains numerous maps, diagrams, and charts, and an excellent index adds to its value as a work of reference.]

Jones (W. H.). *A Survey of the Agricultural and Economic Conditions of a Parish in Carmarthenshire.* Reprinted from the *Welsh Housing and Development Year Book*, 1930.  $9\frac{3}{4}'' \times 7\frac{1}{4}''$ . 27 pp. Cardiff: Welsh Housing and Development Association, 1930. 6d.

[The parish selected for this survey has an area of 5,819 acres and a population which has fluctuated since 1801 between 801 and 1,157. The agricultural information has been collected from 80 farms covering a total area of 6,159 acres. The farms have been classified into milk-selling and butter-making, and investigation has been made into land utilization, liming and manuring, live-stock, employment, financial transactions, and capital equipment. There are numerous tables showing the distribution of area, acreage of crops, the number per acre or per 100 acres of live-stock, labour units, persons engaged, sales of cattle and dairy produce, receipts and expenditure, and other relevant statistics.]

Leake (P. D.). *Commercial Goodwill: its History, Value and Treatment in Accounts.* 2nd ed.  $8\frac{1}{4}'' \times 5\frac{1}{2}''$ . xii + 271 pp. London: Pitman, 1930. 15s.

[The first edition of Mr. Leake's book was reviewed at length in the *Journal* for 1921 (p. 464). The present edition has been revised in accordance with recent legislation, including the Companies Act, 1929, and the Landlord and Tenant Act, 1927. Under the former Act, the amount of the goodwill and of any patents and trade-marks, if ascertainable, must be stated in company balance sheets, so far as they are not written off. The question of compensation for goodwill under the Landlord and Tenant Act, 1927, is discussed in a new chapter. There are four appendices and an index.]

*Management Problems: with special reference to the Textile Industry.* Edited by G. T. Schwennning.  $8\frac{1}{4}'' \times 5\frac{1}{2}''$ . xiv + 266 pp. Chapel Hill, N.C., and Oxford University Press, 1930. 9s.

[This volume consists of eleven addresses on the various aspects of business management which were, with two exceptions, given to the University

of North Carolina Student Branch of the Taylor Society of New York. Of these, three relate especially to management in the textile industry, two to problems of personnel, while the remainder deal with scientific management, including its application to university libraries, and with general administrative organisation and control. Dr. H. S. Pearson, Managing Director of the Taylor Society, contributes an introduction reviewing the whole of the subjects discussed, and comparing the points of view of the several authors. The book is indexed.]

*Mudgett (Bruce D.)*. Statistical Tables and Graphs.  $7\frac{1}{2}'' \times 4\frac{3}{4}''$ . 194 pp. London, Pitman; Cambridge, Mass., Riverside Press, 1930. 5s.

[The author of this book, who is the Professor of Economics in the University of Minnesota, explains that it is the outcome of two years' experience in teaching elementary statistical methods to students preparing to enter the University School of Business Administration. The instruction is thus intended for business men rather than for statisticians, and the aim has been to give the essentials of the graphic representation of statistical data in a concise and practical manner. The first part of the book is concerned with tables, the three chapters dealing respectively with classification of data, tabulation, and the construction of tables of various types. The second and larger portion, entitled Graphic Statistics, gives very clear and detailed information relating to all kinds of graphic representation, beginning with general principles and proceeding by way of pictograms comparing magnitudes and components, to graphs representing functional relationships—frequency distributions, time series, etc., and finally to statistical maps. No mathematical knowledge is necessary for the full understanding of the instruction given. The author begins at the very beginning of his subject and leaves no detail unexplained; specimen tables and graphs are provided in plenty, and exercises are appended to each chapter. In short, this handbook, which, in addition to its other practical merits, has a good index, should be exactly what a number of people are looking for.]

*Rosmanith (G.)*. Mathematische Statistik der Personenversicherung.  $7\frac{3}{4}'' \times 5\frac{1}{4}''$ . vi + 141 pp. Leipzig: B. G. Teubner, 1930. R.M. 8.

[This book is a well-arranged primer. It gives an explanation of rates of mortality and how they are obtained in practice, and shows, with a few numerical examples, how mortality has changed during recent years and that that change, as regards life assurance, depends on the time elapsed since the date of assurance. After giving some of the mathematical formulæ that have been suggested for describing mortality, the author concludes with some notes on interpolation and the normal curve, and a brief reference to frequency curves and correlation. These last-mentioned notes are too abridged to be of much practical use but are only intended to be briefly introductory. A few unimportant misprints occur, but they are unlikely to cause difficulty. The book is a good example of an elementary text-book.]

*Tate's Money Manual*; being the first annual edition of additions, alterations and amendments to the Centenary Edition of *Tate's Modern Cambist*. Edited by *W. F. Spalding*.  $8\frac{1}{4}'' \times 5\frac{1}{4}''$ . xii + 116 pp. London: Effingham Wilson, 1931. 5s.

[The Centenary Edition of *Tate's Modern Cambist*, the well-known work of reference on the world's currencies, exchanges, and weights and measures, was published in December, 1929 (a notice of this work appeared in the *Journal*, Vol. XCIII, 1930, p. 140). The publishers now propose to



issue revised editions at intervals of four years, and to record alterations and additions taking place between the publication of these editions in a series of annual supplements entitled *Tate's Money Manual*. This, the first issue of the *Money Manual*, includes, for example, accounts of the London gold market, the projected new silver coinage of France, the French gold question, and the exchange difficulties of Australia.]

Walker (*Mabel L.*), *Ph.D.* *Municipal Expenditures*. 8 $\frac{1}{4}$ "  $\times$  5 $\frac{1}{2}$ ". 198 pp. Baltimore: Johns Hopkins Press; London: Humphrey Milford, 1930.

[This book is designed to stimulate city governments in the United States towards an endeavour to give the best possible service to their citizens, and, as a means to that end, to assist them in measuring the extent and value of their achievement. The author seeks to establish an objective standard of measurement or norm, by means of "grading cities according to service rendered," not with the object of inducing uniformity, but in order to afford opportunity for comparison and self-examination. "The yardstick for any American city is the yardstick of other cities." Accordingly, the statistics of 250 cities were examined, and the returns of 160 of these were complete enough for them to be graded by a system of marking. The statistical results are shown in a series of tables. The first gives figures measuring the amounts of the various services, benefits, and amenities per head of population; the next shows the rating, *per capita* costs and *per capita* wealth are compared, the towns being divided for this purpose into population-groups. The author comments on present tendencies in budget distribution and on the wide divergences in the distribution of expenditure in various towns; interesting facts come to light in relation to particular cities—Chicago, for instance. A full bibliography and a good index are included.]

## CURRENT NOTES.

The figures of export trade for March are again unsatisfactory, the total value of United Kingdom goods exported in that month being recorded as £33,989,000 compared with £53,946,000 in March, 1930. In the first quarter of 1930 exports were £164,132,000, in the first quarter of 1931 they were £103,346,000, a decrease of about 37 per cent.; exports of articles wholly or mainly manufactured fell from £128,351,000 to £78,399,000, or by nearly 39 per cent. Some part of these decreases has been due to the fall in values, but how much is to be allotted to this cause cannot yet be stated, since, at the moment of writing, the periodical Board of Trade calculations of changes in the volume and value of trade are not available. Unfortunately the Trade Accounts show very general reductions in quantities as well as in values, though in Class I, "Food, Drink, and Tobacco," increases are found in the quantities of oats, maize products, animal feeding-stuffs, fresh fish, and margarine exported in the first quarter of 1931 compared with the first quarter of 1930; the increase in margarine is remarkable, from 8,186 cwt. to 85,365 cwts. Exports of coal fell off by about 30 per cent., from 15,013,000 tons to 10,416,000 tons, and there was a reduction of about 10 per cent. in the quantity of coal shipped for foreign bunkers. Still comparing the first quarters of 1930 and 1931, the decreases in exports of manufactured goods are serious: pottery from 65,000 tons to 40,000 tons, plate glass from 9,900 tons to 6,800 tons, cement from 275,000 tons to 166,000 tons. There was a fall of over one-half in exports of iron and steel and manufactures thereof, from 984,000 tons to 481,000 tons, including galvanized sheets from 138,000 tons to 57,000 tons, tinplates from 148,000 tons to 92,000 tons, railway material from 127,000 tons to 47,000 tons, and plates and sheets (not coated) from 118,000 tons to 46,000 tons. Exports of machinery fell from 131,000 tons to 89,000 tons, and there were decreases in non-ferrous metals, cutlery, tools, hardware, etc.; there was a fall of nearly 30 per cent. in the value of electrical goods and apparatus exported, so this industry has apparently suffered less than others from the depression.

The four textile groups of exports were responsible for about 45 per cent. of the decrease in the value of the exports of manufactured

goods. Exports of cotton yarns declined from 38,100,000 lbs. to 31,400,000 lbs., and exports of cotton piece goods from 894 million square yards to 438 million, those of piece goods to India alone falling from 391·8 million square yards to 100·3 million, and all other markets except Greece, Turkey, Colombia, Ecuador and Hong-Kong showing reductions more or less great. Exports of wool yarns fell from 13,052,000 lbs. to 8,750,000 lbs., and exports of woollen and worsted tissues from 37 to 25·8 million square yards. Among other textile exports an increase in piece goods wholly of silk stands out as remarkable, while there was practically no change in jute yarns, and a fall of only 16·6 per cent. in linen piece goods. Bad trade also affected all classes of apparel, and nearly all classes of chemicals except potassium compounds and coal-tar dyes. Soap, leather, and paper shared in the general decline. The complex group of vehicles showed a decrease of rather over 25 per cent. in value, and most kinds recorded decreases in quantities, railway carriages and motor vessels showing, however, substantial increases.

Gross imports fell in value from £283,503,000 in the first quarter of 1930 to £209,810,000 in the first quarter of 1931, or by nearly 26 per cent., and retained imports from £259,022,000 to £192,481,000, or by 25·7 per cent. Retained imports of food, drink, and tobacco, at £93,242,000 in the first quarter of 1931, were down by 18·3 per cent.; raw materials at £39,002,000 were less by 41·7 per cent.; and manufactured goods at £57,700,000 showed a fall of 23·1 per cent. If non-ferrous metals; refined petroleum and undressed leather are excluded from manufactured goods, the total value of manufactures retained in the first quarter of 1931 was £44,769,000, a fall of 18·6 per cent. from a year earlier, but an increase from 21·2 to 23·3 per cent. in the proportion of retained imports represented by manufactured goods. Retained imports of cereals, flour, and meals showed in the aggregate a substantial rise in quantity and the same is true of meat, but there was not much change in butter and reductions in cheese, eggs, fish, apples and oranges. There was a slight increase in tea and decreases of about 8 per cent. in raw sugar and about 5 per cent. in unmanufactured tobacco. Among raw materials, retained imports of iron ore fell from 1,336,000 tons in January–March, 1930, to 598,000 tons in the corresponding period a year later, and those of raw cotton from 3,786,000 centals to 2,782,000 centals, and there were reductions also in silk cocoons, raw silk, flax, hemp, and jute; on the other hand, retained imports of sheep's and lambs' wool rose from 197 to 221 million lbs. The fall in the imports of raw cotton was mainly in United States cotton (about 45 per cent.), Egyptian cotton decreasing by about one-sixth, and other foreign cotton by

about 4 per cent., while Empire cotton was practically unchanged. There were substantial decreases in timber and pitprops, in dry hides, and in cotton seed, but increases in wet hides, linseed, and oil-nuts, while wood pulp and rubber showed small reductions. Retained imports of iron and steel fell from 845,000 tons to 607,000 tons; there were also decreases in retained imports of lead and zinc, but increases in copper and tin. Retained imports of petroleum slightly increased, but the value fell by about one-third. Iron and steel, non-ferrous metals, machinery, and oils accounted for about 57 per cent. of the fall in the value of imports of manufactured articles.

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In the first three months of 1930 imports of bullion and specie were £11,237,000 in excess of exports, but in the first quarter of 1931 there was an excess of exports amounting to £7,069,000. Taking merchandise, bullion, and specie together there was an excess of imports over exports amounting to £82,066,000 in the first quarter of 1931 compared with £106,126,000 in the first quarter of 1930. Shipping, naturally, to some extent reflected the depressed trade of the quarter; 11,896 vessels of 13,291,000 net register tons entered British ports with cargoes in the first quarter of 1931 against 12,770 vessels of 13,918,000 tons in the first quarter of 1930; departures with cargo were 13,181 vessels of 13,582,000 tons against 15,076 of 16,095,000 tons. British entrances aggregated 8,487,000 tons and departures 8,724,000 tons against 8,895,000 tons and 10,031,000 tons, respectively, a year earlier.

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Wholesale price levels in this country, as measured by the Board of Trade index-number, showed in the first two months of the year a continuation of the downward movement which had continued month by month since October, 1929, when this index-number stood at 81.9 (1924 = 100). For the month of January the figure was 64.3, giving an aggregate decline since October, 1929, amounting to 21.5 per cent., to which food prices contributed by a fall of 21.9 per cent., and prices of industrial materials by one of 21.1 per cent. In comparison with December, 1930, the decline in the general level was 1.8 per cent., and the fall on the prices of a year before was 18.4 per cent. To the latter decrease the largest contributions were made by the prices of cereals (31.9 per cent.), other textiles (31.9 per cent.), wool (31.6 per cent.), and cotton (29 per cent.). The decline of 0.6 per cent. in the index-number of all articles for the month of February still further continued the downward trend of wholesale prices; it was, however, the smallest percentage decline, as compared with the previous month, which had been recorded since the fall began in October, 1929. It may be noted also that the average

Movements and Classes.	Twelve Months ending March, 1930.	Twelve Months ending March, 1931.	Increase (+) or Decrease (—).			
<b>Imports, c.i.f.—</b>	£'000.	£'000.	£'000.			
Food, drink, and tobacco	524,036	454,092	— 69,946			
Raw materials and articles mainly un- manufactured	323,169	218,749	— 104,420			
Articles wholly or mainly manufac- tured ...	339,179	287,908	— 51,271			
Other articles ...	11,920	10,398	— 1,522			
Total Imports ...	1,198,306	971,147	— 227,159			
<b>Exports, f.o.b.—</b>						
<i>United Kingdom Produce and Manufactures—</i>						
Food, drink, and tobacco	55,942	45,415	— 10,527			
Raw materials and articles mainly un- manufactured	78,784	56,805	— 21,979			
Articles wholly or mainly manufac- tured ...	557,003	389,800	— 167,203			
Other articles ...	20,585	17,747	— 2,838			
<i>Imported Merchandise—</i>						
Food, drink, and tobacco	25,733	23,172	— 2,561			
Raw materials and articles mainly un- manufactured	48,743	34,200	— 14,543			
Articles wholly or mainly manufac- tured ...	29,134	21,825	— 7,309			
Other articles ...	475	631	+ 156			
Total Exports ...	816,399	589,595	— 226,804			
<b>Bullion and Specie—</b>						
Imports ...	87,062	88,219	+ 1,157			
Exports ...	89,044	101,495	+ 12,451			
<b>Movements of Shipping in the Foreign Trade—</b>	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.
<i>Entered with cargoes—</i>						
British ...	32,030	40,987	30,670	40,380	— 1,360	— 607
Foreign ...	26,307	22,472	25,765	22,708	— 542	+ 236
Total entered ..	58,337	63,459	56,435	63,088	— 1,902	— 371
<i>Cleared with cargoes—</i>						
British ...	40,964	45,498	37,661	41,313	— 3,303	— 4,185
Foreign ...	23,815	23,741	21,550	22,028	— 2,265	— 1,713
Total cleared ...	64,779	69,239	59,211	63,341	— 5,568	— 5,898

indices both for food and for industrial materials showed no change in the second half of February from their values for the first half of the month. Average prices for the month in comparison with those of January showed falls in the prices of cereals and of meat and fish amounting to 0.2 per cent. and 5.2 per cent. respectively, while the index-number for "other foods" showed an increase of 1.5 per cent. Among industrial materials the most noticeable variations were an average increase of 4.1 per cent. in respect of the cotton group, and a decrease of 4 per cent. for textiles other than cotton and wool. If the average for the year 1913 be substituted as the base, the index-number for February was 106.2, that for food-stuffs being 111.8, and that for industrial materials being 103. Within these two major divisions the group indices ranged from 97.6 for cereals to 128 for "other foods," and from 80.2 for textiles other than cotton and wool to 109.2 for the miscellaneous group respectively.

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As measured by the *Statist* index-number, wholesale prices continued their downward movement during January. At the end of that month the index-number stood at 85.7, or 1.4 per cent. lower than the month before. It is interesting to note that the index-number at the end of January, 1913 was 86.4, i.e., nearly 1 per cent. above the January, 1931, figure. Compared, however, with the average figure for 1913, viz. 85, the figure at the end of January was less than 1 per cent. above the pre-war level. During February there was a further fall, but there was greater evidence of resistance and stability in prices, and the fall (0.2 per cent.), which was the smallest recorded since the slump began in August, 1929, still left the index-number at 85.5, a fraction above the 1913 level. Over the intervening nineteen months since August, 1929, wholesale prices had fallen by 25.7 per cent. The slight reduction in February was altogether due to the influence of price movements in the food-stuffs group, and in particular to lower prices for meat and tea. The group index-number for industrial materials actually rose by 1.8 per cent. during February. The *Statist's* international comparison of wholesale prices shows the world-wide extent of the recent slump; in the case of one important index-number, viz. Bradstreet's index for wholesale prices in the United States, the figure for February actually fell below the 1913 level by 0.5 per cent.

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A further downward plunge of wholesale prices was recorded by the *Economist* index-number at the end of January, a fall of 3.5 per cent. on the month following a decline of 3.1 per cent. in December and carrying the index-number to the low level of 66.3 (1927 = 100). For the first time since July, 1929, this index-number at the end of

February showed an upward movement, though the increase was only a third of 1 per cent. and still left the level at 66·5 lower than a year before by 21 per cent. Like the *Statist*, the *Economist* noted as an encouraging feature the fact, whereas the movement of food prices was irregular, resulting on balance in a further appreciable decline, a considerable number of important raw materials moved upwards, and both the textiles and minerals groups showed a rise of over 2 per cent. If 1924 be taken as 100, the figure at the end of February worked out at 57·5, as compared with 72·8 a year before. On the 1913 basis it stood at 91·6; the only group index-number above the 1913 level was "other foods" at 108·4, and this was balanced by a lower figure for cereals and meat, so that, taken together, the two figures showed even wholesale food-stuffs at approximately their pre-war level, while the group indices for raw materials ranged from 22 per cent. (textiles) to 6·5 per cent. (minerals) below that level.

According to the returns collected by the Ministry of Labour as to movements of retail prices in Great Britain and Northern Ireland, between January 1 and January 31 there was a decline in the average level of retail prices of food as a result of reductions in the prices of eggs, bread and flour, butchers' meat, bacon and cheese. Potatoes, however, advanced in price. The net result of all these changes was that the general level of retail food prices, expressed as a percentage of the level in July, 1914, fell from 138 to 136. During February there were reductions in the average prices of eggs, bread and flour, butchers' meat, and bacon, but these were partly counter-balanced by increases in the prices of butter. The net result was a further reduction in the index-number from 136 to 134 on February 28. If account be taken of all the items included in the budget in addition to food, the index-number of general retail prices, which stood at 153 on January 1, fell to 152 on January 31, and further to 150 on February 28. Since the expenditure on food represents 60 per cent. of the total expenditure in the original budget, it would appear that the level of retail prices other than food remained about 175, with a slight downward tendency, the principal items on February 28 being rent (154), clothing (200) and fuel and light (175).

The following table summarizes for the principal countries the latest information as to retail prices overseas as reproduced in the *Labour Gazette*. The third column gives the estimated percentage increase in retail food prices on those ruling in July, 1914, or some similar pre-war period; the fourth column gives the estimated percentage increase for all the items covered by the budget in each

case, such items, in addition to food, comprising, generally, rent, clothing, fuel and light, and other household requirements.

Country.	Date of Latest Return.	Food.	All Items.
		Percentage increase.	Percentage increase.
<i>Overseas, Dominions, etc.</i>			
Australia ... ..	January, 1931	35	45 (2nd qr.)
Canada ... ..	January, 1931	34	50
India (Bombay)*... ..	February, 1931	6	14
Irish Free State ... ..	January, 1931	54	66
New Zealand ... ..	January, 1931	35	54
South Africa ... ..	January, 1931	8	26
<i>Foreign Countries.</i>			
Belgium ... ..	January, 1931	—	746
Czechoslovakia ... ..	December, 1930	18	3 (Prague)
Denmark ... ..	January, 1931	26	59
Egypt (Cairo) ... ..	October, 1930	32	—
France (Paris) ... ..	February, 1931	550	497 (4th qr.)
France (other towns) ... ..	November, 1930	550	—
Germany ... ..	February, 1931	31	39
Holland (Amsterdam) ... ..	December, 1930	—	57
Italy ... ..	December, 1930	363 (Jan.)	408 (Milan)
Norway ... ..	February, 1931	43	70
Spain (Madrid) ... ..	January, 1931	98	—
Sweden ... ..	February, 1931	32	61 (Jan.)
Switzerland ... ..	January, 1931	48	56
United States ... ..	January, 1931	30	61 (Dec.)

\* Native families.

With reference to statistics relating to employment in Great Britain and Northern Ireland quoted on p. 125 of Part I, 1930, of the *Journal*, the *Labour Gazette* reported fluctuations in the course of employment during the first few months of the year, the net effect being a decrease in the numbers unemployed during January, followed by a slight increase during February. The following table summarizes the principal figures for the two months in comparison with the position at the end of 1930, and the position a year before.

Date.	Number of Persons on Employment Exchange Registers.		
	Numbers Unemployed (excluding persons normally in casual employment).	Numbers Temporarily stopped.	Numbers Unemployed normally in casual employment.
Dec. 29, 1930 ... ..	1,766,398	774,630	102,099
Jan. 26, 1931 ... ..	1,875,330	607,443	109,877
Feb. 23, 1931 ... ..	1,888,716	613,692	115,250
Feb. 24, 1930 ... ..	1,083,895	366,844	88,526



Among workpeople insured against unemployment in Great Britain and Northern Ireland, the percentage unemployed in all industries taken together on January 26 was 21·5, as compared with 20·2 on December 22, and a month later on February 23 it had risen slightly to 21·7. On February 24, 1930, the percentage was 12·9.

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Official statements as to employment in Germany, quoted from the *Reichsarbeitsblatt* by the *Labour Gazette*, showed that notwithstanding the influence of Christmas trade, the economic situation as a whole became worse in December, and the depression was intensified in January by the usual seasonal decline. During December the total number of persons reported by the Employment Exchanges as available for and seeking work rose from 3,763,408 to 4,438,910, and by the end of January this number had risen to 4,956,464. The provisional figure for the end of February was 5,042,500. Similar increases were reported in the number returned as unemployed, which rose from 3,698,946 at the end of November to 4,886,625 at the end of January, while a provisional figure for the end of February stood at 4,972,000. Among the members of national trade unions with a total membership of about 4½ millions, the percentage of unemployment rose from 26 on November 29 to 34·2 on January 31, as compared with 22 at the end of January, 1930. In France unemployment was still on a much smaller scale, but it showed a marked increase in January and February. The total number of persons on the registers of the Employment Exchanges rose in these two months from 26,514 to 59,500 as compared with 13,086 a year before. For Belgium the latest figures quoted relate to November and December, and are based upon returns from approved unemployment insurance societies with a total membership of nearly 700,000. During November the percentage of unemployment among members rose from 4·3 to 6·1, and by the end of December to 9·3, as against 2·4 at the end of 1929. In the Scandinavian countries, the Norwegian trade union returns also showed a level of unemployment above that of a year before, viz. 21·8 per cent. at the end of 1930 as against 14·5 per cent. a year before. A similar increase is revealed by the Swedish trade union returns, in which the annual increase to the end of January was from 13·9 to 19·8 per cent. In Denmark returns supplied to the Danish Statistical Department by trade unions and by the Central Employment Exchange gave an unemployment percentage of 24·6 at the end of December, and 24·4 at the end of January; at the end of the latter month in 1930 the figure was 20·3.

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In Canada the index-number of employment is based upon returns received from over 7,500 firms employing approximately one million workpeople, and has as its base the average volume of employment during the year 1926. Standing at 108.5 at the beginning of December, it fell to 101.7 at the beginning of January, revealing a curtailment of employment since a year before, when it stood at 111.2. The monthly report on employment issued by the Federal Department of Labour Statistics at Washington now rests upon returns received from about 42,000 establishments in various branches of industry and commerce, and covers  $4\frac{1}{2}$  million workpeople. Both in December and January this record showed shrinkages of employment amounting to 1 per cent. and 4.2 per cent. respectively. The index-number of employment, which has a more restricted basis, being confined to manufacturing industries, fell from 76.5 for November to 75.1 for December and further to 73.1 for January. For January, 1930, the index-number was 90.2.

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Few countries or nations appear to have escaped the disturbing effects of post-war unemployment—so widespread in its range, so persistent and long-lasting, as to have no parallel in history, and for which an effective remedy seems, so far, to have been sought in vain. In *Population et Chômage*, published by the International Labour Bureau, Geneva, Professor M. L. Hersch, Professor of Statistics and Demography at the University of Geneva, discusses this international problem with shrewd impartiality.

Some authorities have concluded that over-population and too rapid increase of population are the factors responsible for the appearance of this social and economic evil; having regard to the fact that the population in Europe doubled itself in the course of a single century, and in 1930 had reached a figure no less than treble that of the population obtaining in 1800 (and this in spite of unrestricted large-scale emigration during the nineteenth century plus the devastating losses caused by the Great War during the twentieth century), such views found somewhat ready acceptance. But, Professor Hersch submits, the problem is far too complex to admit of such ready explanation. In his opinion, not one, but many factors have combined to exert their influences in bringing about existing displacements in the economic life of this or that nation; national tendencies and sentiments, restrictive laws governing immigration and emigration, declining birth-rates, are but some of the more obvious factors which have played their part, and yet there remain other subtle, less easily traceable but far-reaching influences at work; it cannot be said that unemployment is due to population increase, displacement of sex constitution, decline or

increase in the proportions of males of working age—whether these influences are considered singly or in the aggregate; the problem calls for more searching analysis.

The author presents the relevant data relating to a number of countries in support of his views, discusses the various expedients suggested or adopted with a view to the mitigation of the evil, examines the *pros* and *cons* of Free Trade, Protective Tariffs, and other factors which, to him, appear to have a direct or an indirect bearing upon the important matters at issue. In his opinion, restrictive immigration laws and protective tariffs, by impeding the free circulation of peoples and merchandise, appear to be harmful measures, provoking conditions of unemployment. The problem is irritatingly complex, demanding carefully considered study of both demographic and economic aspects, since no single-track approach is likely to permit the formulation of any practical scheme which can produce, in appreciable measure, either reduction or prevention of unemployment.

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The Study Group of the Society has met three times since the last issue of the Journal. The fifth meeting of the Session was held in February, when Mr. H. C. Craft read a paper on "Statistics of Foreign Trade" to an appreciative audience. In March, Dr. J. O. Irwin opened a discussion on "Is the Universe Statistical?" The attendance was rather larger than usual and a very general discussion quickly ensued. Mr. Dudley Walton read a paper at the April meeting on the subject of measuring by sample the potential purchasing power of a community. This contribution was especially appreciated by those interested in the subject from the point of view of the advertising consultant.

We have been very fortunate in obtaining the consent of Professor Secrist of the North Western University, U.S.A., to address us on May 5th, at the eighth meeting of the Group. His subject will be "Business Expense Ratios" and all who are interested in this work are warmly invited to join us at 6 p.m. on that day in the Society's room.

# STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

## UNITED KINGDOM—

### *Bankers' Magazine*—

*February*, 1931—The bank balance sheets. Industrial depression—some suggested causes and remedies. Credit and trade in 1930.

*March*, 1931—Bankers, industry, and politics. National economy: government expenditure: where to begin (with chart): *A. J. Liversedge*. Prices and gold: *J. E. Roberts*.

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*Royal Meteorological Society, Quarterly Journal*, *January*, 1931—Changes of climate in the Old World during historic times: *G. E. P. Brooks*.

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*Secretary, February, 1931*—An index of production.

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*Actuarial Society of America, Transactions, October, 1930*—Graduation of marriage and remarriage tables by mathematical formulas : *Edward Olifiers*. Mortality experience of the Penn Mutual Life Insurance Company on cases of \$50,000 or more : *Oliver W. Perrin*.

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*Revista de Ciencias Económicas*—

*November, 1930*—Las relaciones económicas argentino-germanas : *Emilio Wehrle*. Los aranceles norteamericanos y europeos y la economía argentina : *D. O. Grognet*.

EGYPT—

*L'Égypte Contemporaine, December, 1930*—Relations entre la récolte et le prix du coton égyptien : *C. Bresciani-Turroni*.

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*February, 1931*—Le problème de l'or à la Banque de France et en Grande-Bretagne: *Edouard Payen*. L'industrie pétrolière dans le monde: *R. J. Pierre*. L'impôt sur les transports: *Georges de Nowvion*.

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*February, 1931*—Essai d'une statistique des fraudes commises au préjudice des compagnies d'assurances: *Pierre Véron*.

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GERMANY—

*Allgemeines Statistisches Archiv, Band 21, Heft I*—Weltlohniveau? Eine Antwort der internationalen Statistik: *Friedrich Zahn*. Nichtkorrekte statistische Verfahren: *Franz Zizek*. Vom "Gesetz" in der Statistik: *H. Wolff*.

*Blätter für Versicherungs-Mathematik, January, 1931*—Der Stieltjessche Integralbegriff und seine Verwertung in der Versicherungsmathematik: *Alfred Loewy*. Zum Problem der Erneuerung: *Ernst Zwinggi*. Zur Frage der "Gute" von Sterbetafeln: *Karl Freudenberg*. Über säkulare Sterblichkeitsänderungen in Deutschland: *W. Ibsch*.

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*Teil A*—Die Weltkonjunktur Ende Februar 1931. Die Konjunktur in Deutschland Ende Februar 1931.

*Teil B*—Wirtschaftszahlen des In- und Auslands.

*Weltwirtschaftliches Archiv, January, 1931*—Die Bank für Internationalen Zahlungsausgleich: *Edgar Salin*. Protection and non-competing groups: *Bertil Ohlin*. Die Finanzierung des russischen Aussenhandels: *E. M. Shenkman*. Kapitalbildung und Steuersystem: *H. Herkner*.

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*Zeitschrift für die Gesamte Versicherungs-Wissenschaft, January, 1931*—Die Änderung der deutschen Versicherungs-Staatsaufsicht: *A. Petersen*. Das Selbstmordproblem in der Lebensversicherung: *Elfriede Kuhr*. Die Selbstmordsterblichkeit deutscher Lebensversicherter: *Carl Bennewitz*.

ITALY—

*Le Assicurazioni Sociali, No. 6, 1930. Supplement*—Juvenile unemployment in Great Britain and the measures taken to combat it: *Margaret G. Bondfield*. De Soziallasten in Deutschland: *Paul Moldenhauer*. Tuberkulose-Fürsorge in verschiedenen Staaten unter besonderer Berücksichtigung Deutschlands: *H. E. Schuchardt*. Die Reform der deutschen Krankenversicherung: *Fritz Stier-Somlo*.

*Giornale degli Economisti e Rivista di Statistica*—

*December, 1930*—Osservazioni intorno alla misura statistica dell' utilità finale: *Lionello Rossi*.

*January, 1931*—Le dottrine sui trasferimenti e il problema delle riparazioni germaniche: *J. G. Kretschmann*. Equazione differenziale della domanda e teoria matematica delle crisi economiche: *Luigi Amoroso*. Il consiglio nazionale delle corporazioni e alcune istituzioni affini di altri stati: *Gerolamo Bassani*. Del principio "produttivistico" nei sistemi di imposizione personale del reddito: *Ernesto D'Albergo*.

*Giornale dell' Istituto Italiano degli Attuari, January, 1931*—Sulla legge forte dei grandi numeri: *Paul Lévy*. Sui momenti di una funzione di frequenza: *Carmela di Stefano*. Sulla relazione fra utile di interesse (soprainteresse) e premio d'assicurazione: *Federico Zalai*. Sulla legge di distribuzione dei redditi: *E. Del Vecchio*.

*Giornale di Matematica Finanziaria, August-December, 1930*—Le matematica come creazione del pensiero e come strumento tecnico: *G. Fubini*. Di una funzione di sopravvivenza: *F. Insolera*. Das jährliche mathematische Risiko der Versicherungen, bei denen zwei von einander verschiedene Ereignisse die vorzeitige Auflösung herbeiführen können: *H. Koeppler*.

*La Riforma Sociale, January-February, 1931*—"Gold Standards" del 1914 e del 1931 nell' inchiesta della lega delle nazioni: *Attilio Cabiati*. Riflessioni in isordine sulle crisi: *Luigi Einaudi*.

JAPAN—

*Kyoto University Economic Review, December, 1930*—The disparity between the rich and the poor in the big cities of Japan: *S. Shiomì*. On the financial development of Japan: *E. Honjo*.

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*Ekonomisk Tidskrift, Häft 4, 1930*—En försäkringsfråga: *Gustav Cassel*.

SWITZERLAND—

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Methodische Untersuchungen zu den bevölkerungsstatistischen Grundlagen der schweizerischen Alters- und Hinterlassenenversicherung: *Karl Goldziher*. Die schweizerische Baumwollindustrie: *Caspar Jenny*. Die Lebenshaltungskosten eines in der Fordautomobilfabrik in Detroit (V. St. A.) beschäftigten Arbeiters: *O. Eisenberg*.

INTERNATIONAL—

*Revista Internazionale di Science Sociali e Discipline Ausiliarie, May, 1930—*Saggio sugli studi di dinamica economica: *Giovanni Demaria*.



## LIST OF ADDITIONS TO THE LIBRARY.

Since the issue of Part I, 1931, the Society has received the publications enumerated below :—

## I.—OFFICIAL PUBLICATIONS.

## (a) United Kingdom and its several Divisions.

## United Kingdom—

*Empire Marketing Board.* Statistics and Intelligence Branch. Production and trade of the following countries :—Kenya and Uganda, 23 pp.; Nyasaland, 15 pp.; Northern Rhodesia, 18 pp.; Southern Rhodesia, 19 pp.; Zanzibar, 15 pp. London: H.M.S.O., 1930-31.  $9\frac{3}{4}" \times 7\frac{1}{4}"$ . 2d. each. (The Board.)

*Overseas Trade, Department of—*

Reports on economic conditions as follows :—Argentine Republic (Oct. 1930), 129 pp., 3s. 6d.; British West Indies, and Contiguous British Territories (Oct. 1930), 94 pp., 2s. 6d.; Republics of Guatemala, Honduras, and Nicaragua (Oct. 1930), 75 pp., 2s. 3d.; East Africa, Northern Rhodesia, Nyasaland, and British Somaliland, 96 pp., 2s. 9d. Siam (close of third quarter 1930), 42 pp., 1s. 9d. London: H.M.S.O., 1931.  $9\frac{1}{2}" \times 6"$ . (The Department.)

Report of the United Kingdom Trade Mission to the Union of South Africa, Southern Rhodesia, and Northern Rhodesia.  $9\frac{1}{2}" \times 6"$ ; 61 pp. London: H.M.S.O., 1931. 1s. (The Publishers.)

Report of the Sheffield Industrial Mission to South America, Aug.-Nov., 1930.  $9\frac{1}{2}" \times 6"$ ; 80 pp. London: H.M.S.O., 1931. 1s. 3d. (*Id.*)

*Trade, Board of.* Statistical tables relating to British and Foreign trade and industry (1924-30). Part I. General tables.  $9\frac{1}{2}" \times 6"$ ; 377 pp. London: H.M.S.O., 1930. 5s. 6d. (The Board.)

*Transport, Royal Commission on.* Final report. The co-ordination and development of transport.  $9\frac{1}{2}" \times 6"$ ; x + 240 pp. London: H.M.S.O., 1931. 4s. (Purchased.)

## England and Wales—

*Health, Ministry of.* Vaccination. Further report of the Committee.  $9\frac{1}{2}" \times 6"$ ; 114 pp. London: H.M.S.O., 1930. 2s. 6d. (The Ministry.)

*Industrial Health Research Board.* Report No. 61. The nervous temperament. *M. Culpin* and *May Smith*.  $9\frac{1}{2}" \times 6"$ ; 52 pp. London: H.M.S.O., 1930. 1s. (The Board.)

## (b) India, Dominions, and Protectorates.

## India—

Imperial Library. Catalogue. Part II. Subject-index to the author catalogue. First supplement.  $9\frac{3}{4}" \times 6\frac{3}{4}"$ ; 575 pp. Calcutta, 1929. (The Library.)

## Meteorological Department—

Memoirs. Vol. XXV. Part VI. The wind at Agra and its structure.  $12" \times 9"$ ; pp. 195-251 + 7 charts. (The High Commissioner for India.)

Scientific notes. Vol. II. No. 15—Winds in higher levels over Agra. 6 pp. + 11 graphs. 1s. 9d. No. 16—Winds in the first 3 km. over Port Blair. Pp. 46-63. 1s. 3d. No. 17—Parts A, B, C, and D. Tables

(b) India, Dominions, and Protectorates—*Contd.*

of monthly average frequencies of surface and upper winds up to 3 km. in India. 2s. 3d., 2s. 3d., 1s. 6d., 1s. 6d. respectively. Vol. III. No. 18—The structure of the Madras storm of January 1929. 12 pp. + 11 graphs. 2s. 6d. No. 19—Distribution of air density at M.S.L. over India. 2 pp. + 10 graphs. 2s. Calcutta, 1930.  $10\frac{1}{2}'' \times 6\frac{1}{2}''$ . (*Id.*)  
*Madras. District Gazetteers. Statistical appendices as follows:—Bellary, v + 109 pp. 2 Rs.; Cuddapah, iv + 107 pp. 2 Rs.; Anantapur, xv + 130 pp. 2 Rs. 8 as. Ganjam, vi + 97 pp. 1 Rs. 10 as. Madras, 1930.  $9\frac{1}{2}'' \times 6''$ .*

## Irish Free State—

Industry and Commerce, Department of. Census of production, 1929. Reports, Nos. 1-6, 8-11, on the following industries:—Tobacco, 6 pp.; boot and shoe, 5 pp.; bacon curing, 5 pp.; woollen and worsted, 6 pp.; soap and candle, 6 pp.; hosiery, 6 pp.; butter, cheese, and margarine, 16 pp.; malting, 6 pp.; brewing, 7 pp.; whiskey distilling, 6 pp. Dublin, 1930-31.  $13'' \times 8''$ . (The Department.)

## Canada—

Statistics, Dominion Bureau of. Canada, 1931. An official handbook of present conditions and recent progress.  $8\frac{1}{2}'' \times 5\frac{1}{2}''$ ; 199 pp. Ottawa, 1931. 25 c. (The Bureau.)

## Straits Settlements—

Short statistical summary, 1930.  $4\frac{3}{4}'' \times 6\frac{3}{4}''$ ; vi + 70 pp. Singapore, 1930. \$1. (Department of Statistics.)

Malaya rubber statistics, 1930. Acreage, crops, imports, and exports. Revised ed.  $5\frac{1}{2}'' \times 9\frac{1}{4}''$ ; 59 pp. Singapore, 1930. \$1. (*Id.*)

## Union of South Africa

Census and Statistics Office. Fourth census of the population, 1926. Part XI. Occupations (Europeans).  $9\frac{1}{4}'' \times 10''$ ; 221 pp. Pretoria, 1930. 10s. 6d. (The Office.)

## (c) Foreign Countries.

## Brazil—

Recenseamento 1920. Vol. IV. 5a parte. População do Brazil, por estados e municípios, segundo o sexo, a nacionalidade, a idade e as profissões. 851 pp.; 6a parte. Estatística predial e domiciliaria. xx + 724 pp. Rio de Janeiro, 1930.  $10\frac{1}{2}'' \times 7\frac{1}{2}''$ . (Directoria Geral de Estatística.)

## China—

National Tariff Commission. Statistical series No. IV. The cost of living index-number in Shanghai.  $10\frac{1}{4}'' \times 7\frac{1}{2}''$ ; 28 pp. Shanghai, 1930. \$40. (The Commission.)

## Czechoslovakia—

Aperçu statistique de la république Tchécoslovaque.  $7\frac{1}{2}'' \times 5\frac{1}{2}''$ ; 320 pp. Prague, 1930. (L'Office de Statistique.)

Les élections aux conseils de province en 1928.  $12'' \times 9''$ ; xvi + 43 pp. Prague, 1929. 10 Kč. (*Id.*)

Recensement de la population, 1921. Tome III.  $12\frac{1}{2}'' \times 9\frac{1}{4}''$ ; lxiv + 190 pp. Prague, 1927. 40 Kč. (*Id.*)

## Finland—

Officiella Statistik. VI. Befolkningsstatistik. 69. Den Åktenskapliga Fruktsamheten.  $10\frac{1}{2}'' \times 7\frac{1}{2}''$ ; 42 pp. Helsingfors, 1930.

## France—

Résultats statistiques de recensement général de la population, 1926. Tome I. Partie II. Population présente totale. 114 pp.; Tome III. Population présente. Résultats par département. Paris, l'ouest et sud-ouest. viii + 196 pp. Paris, 1930.  $10\frac{1}{2}'' \times 8\frac{1}{2}''$ . (Statistique Générale.)

(c) Foreign Countries—*Contd.*

## Germany—

## Statistik des deutschen Reichs—

Bände 361. Umsatz und Umsatzsteuer in Deutschland nach den Umsatzsteuerveranlagungen 1926 bis 1928. 285 pp. 25 *Rm.*; 379. Statistik der Vermögensteuerveranlagung 1927. 451 pp. 28 *Rm.*; 386. Die Ergebnisse der forstwirtschaftlichen Erhebung im Jahre 1927. 127 pp. + 11 farbigen Karten. 12 *Rm.* Berlin, 1930. 14" × 10½". (Statistisches Reichsamt.)

## Hungary—

Recensement des travailleurs intellectuels, 1928. 10½" × 7½"; 14 + 190 pp. Budapest, 1930. 5 *pengős.* (L'Office Central Royal Hongrois de Statistique.)

Budapest. Kommunal-statistisches Amt. Die sozialen und wirtschaftlichen Verhältnisse der Arbeiter in Budapest. 10½" × 7½"; 38 + 1143 pp. Budapest, 1930. 20 *pengős.* (Mr. E. H. Godfrey.)

## Latvia—

Riga. Rigas Wohnungsverhältnisse nach der Zählung, 1930. 10½" × 6½"; 16 pp. Riga, 1931. (Statistisches Amt der Stadt.)

## Netherlands East Indies—

Centraal Kantoor voor de Statistiek. Bulletin No. 81. De Betalingsbalans van Nederlandsch-Indië in de Jaren 1925 tot en met 1929. 10½" × 7½"; 32 pp. Weltevreden, 1930. (Centraal Kantoor.)

— Preliminary results of the census of 1930. Part I. Java and Madura. 10½" × 7"; xxiii + 79 pp. Weltevreden, 1931. (*Id.*)

## Norway—

Foreløbige resultater av Folketellingene i Norge, 1930. 10" × 6½"; 23 pp. Oslo, 1931. *Kr.* 1. (Statistiske Centralbyrå.)

## Poland—

Bank of Poland. Combined report of the quarterly reports of the financial adviser to the Polish Government. 4th quarter 1927 to 3rd quarter 1930, inclusive. 10½" × 8½"; 342 pp. Warsaw, 1930. (The Bank.)

## Roumania—

Cercetari asupra valorii nutritive a Porumbului Vechiu. 9½" × 6½"; 512 pp. Bucarest, 1930. (Ministerul Agriculturii si Domeniilor.)

## Russia—

Statistical Year-book, 1928. 6½" × 5½". Moscow, 1929. (Central Statistical Office.)

Collective farms of the Moscow district. 8½" × 5½"; 25 pp. + 15 pp. of tables. Moscow, 1930. (Section d'Economie et de Statistique du Comité.)

Industrial structure of the Moscow district in the years of the Revolution. 8" × 5½"; 31 pp. Moscow, 1930. (*Id.*)

The plan of construction in the Moscow district for 1929-30. 9½" × 6½"; 160 pp. Moscow, 1930. (*Id.*)

Ukraine. Académie des Sciences. Travaux de l'Institut Démographique, Tome VII. No 22. Recueil de la classe des sciences. 10½" × 7"; 326 pp. Kiev, 1930. (The Academy.)

## Sweden—

Stockholm. Statistical Office. Administrative organization of the City of Stockholm. *J. Guinchard.* 10½" × 8"; 5 pp. Reprint. (The Author.)

## Switzerland—

Contributions à la statistique suisse. Fasc. 1. 1929-30. 9½" × 6½"; 79 pp. Bern, 1930. (Bureau Fédéral de Statistique.)

Résultats provisoires du recensement fédéral de la population, 1930. Fasc. 12. 11½" × 8½"; 32 pp. Bern, 1931. (*Id.*)

(c) Foreign Countries—*Contd.*

## United States—

*Agriculture, Department of—*

- The determination of hour control for adequate fire protection in the major cover types of the California pine region. 9" × 5½"; 46 pp. Washington, 1930. 10 c. (The Department.)
- Circular No. 121. Co-operative marketing and purchasing, 1920-1930. 9" × 5½"; 55 pp. Washington, 1930. 10 c. (*Id.*)
- Farmers' Bulletin Nos. 1631. Broomcorn. Growing and handling. 36 pp. 10 c.; 1632. Karakul sheep. 9 pp. 5 c. Washington, 1930. 9" × 6". (*Id.*)
- Miscellaneous Publications. Nos. 81. Recommendations of the Bureau of Animal Industry on problems of live-stock production. 14 pp. 5 c.; 95. The world wheat outlook 1930, and facts that farmers should consider. 39 pp. Washington, 1930. 9" × 5½". (*Id.*)
- Technical Bulletin No. 192. Wintering steers in the North Central Great Plains section. 9" × 5½"; 13 pp. Washington, 1930. 5 c. (*Id.*)
- Children's Bureau.* Publication No. 199. Child labor in New Jersey. Part 3. The working children in Newark and Paterson. 9" × 5½"; 94 pp. Washington, 1930. 15 c. (The Bureau.)
- Employment, President's Emergency Committee for.* A survey of unemployment relief in industry. 9" × 5½"; 5 pp. Washington, 1930. (Department of Commerce.)
- Outline of industrial policies and practices in time of reduced operation and employment. 9" × 5½"; 5 pp. Washington, 1931. (*Id.*)
- Federal Trade Commission—*
- Annual report for the fiscal year ended June 30, 1930. 9" × 5½"; 246 pp. Washington, 1930. 25 c. (*Id.*)
- Bakery combines and profits. 9" × 5½"; 95 pp. Washington, 1927. (The Commission.)
- Bread and flour, Competition and profits in. 9" × 5½"; xxxii + 509 pp. Washington, 1928. (*Id.*)
- Co-operative marketing. 9" × 5½"; xvi + 721 pp. Washington, 1928. (*Id.*)
- Cotton-seed industry, Investigation of. 9" × 5½"; vii + 2141-3425 pp. Washington, 1931. (*Id.*)
- Electric-power industry. Control of power companies. 9" × 5½"; xxxviii + 272 pp. Washington, 1927. (*Id.*)
- Supply of electrical equipment and competitive conditions. 9" × 5½"; 282 pp. Washington, 1928. 45 c. (*Id.*)
- Flour-milling, Competitive conditions in. 9" × 5½"; 140 pp. Washington, 1926. 25 c. (*Id.*)
- Grain Trade, Report of the Commission on. Vol. VII. Effects of future trading. 9" × 5½"; xxiv + 419 pp. Washington, 1926. 90 c. (*Id.*)
- National wealth and income. 9" × 5½"; xvi + 381 pp. Washington, 1928. 50 c. (*Id.*)
- Newsprint paper industry. 9" × 5½"; 116 pp. Washington, 1930. (*Id.*)
- Petroleum industry. Prices, profits, and competition. 9" × 5½"; xxii + 360 pp. Washington, 1928. (*Id.*)
- Resale price maintenance. Part I. 9" × 5½"; 141 pp. Washington, 1929. (*Id.*)
- Stock dividends. 9" × 5½"; vii + 273 pp. Washington, 1927. (*Id.*)
- Trade practice conferences. 9" × 5½"; 218 pp. Washington, 1929. 35 c. (*Id.*)
- Foreign and Domestic Commerce, Bureau of—*
- German chemical developments in 1929. 9¼" × 5½"; 32 pp. Washington, 1930. 10 c. (The Bureau.)
- Trade Information Bulletin No. 731. American direct investments in foreign countries. 9" × 5½"; 57 pp. Washington, 1930. 10 c. (*Id.*)
- Labor Statistics, Bureau of.* Bulletin Nos. 523. Wages and hours in the manufacture of airplanes and aircraft engines, 1929. 53 pp. 10 c.; 524. Building permits in the principal cities of the United States in 1929. 109 pp. 20 c.; 528. Labor legislation 1929. 126 pp. 20 c.; 529. Workmen's compensation of the Latin American countries. 304 pp. 65 c. Washington, 1930. 9" × 5½". (The Bureau.)

(c) Foreign Countries—*Contd.*United States—*Contd.*

*Women's Bureau.* Bulletin No. 82. The employment of women in the pineapple canneries of Hawaii. 9" × 6"; 30 pp. Washington, 1930. 15 c. (The Bureau.)

*California. Industrial Relations, Department of.* Special Bulletin No. 2. Middle-aged and older workers in California. 9" × 6"; 98 pp. San Francisco, 1930. (The Department.)

## (d) International.

## International Institute of Agriculture—

Bureau of General Statistics. Forests and forestry. Statistical and other information for certain countries. 9½" × 6¼"; 425 pp. Rome, 1925. (Mr. E. H. Godfrey.)

## International Labour Office—

Studies and reports, Series N., No. 16. Statistical methods for measuring occupational morbidity and mortality. 9½" × 6¼"; 208 pp. London: P. S. King, 1930. 5s. (The Publishers.)

## League of Nations—

## Economic and Financial section—

Bulgarian refugees, Settlement of. Seventeenth report of the Commissioner of the League in Bulgaria. 13" × 8½"; 15 pp. Geneva, 1930. (The League.)

Concerted economic action, Second International Conference. 13" × 8½"; 17 pp. Geneva, 1930. (*Id.*)

— Foreign trade of Europe in the principal agricultural products in 1929. Tables prepared by the Secretariat on the basis of official trade publications of the respective countries. 13" × 8½"; 52 pp. Geneva, 1930. (*Id.*)

— Preliminary Conference, Proceedings. 13" × 8½"; 447 pp. Geneva, 1930. (*Id.*)

Le crédit agricole dans certains pays de l'Europe Centrale et Orientale. 13" × 8½"; 65 pp. Geneva, 1931. 3 fr. (*Id.*)

Double taxation and fiscal evasion. Collection of international agreements and internal legal provisions for the prevention of. Vol. III. 10" × 7¼"; 110 pp. Geneva, 1930. 3s. (*Id.*)

Economic Committee and Economic Consultative Committee. Index to the reports of. 13" × 8½"; 33 pp. Geneva, 1930. (*Id.*)

Financial Committee. Report to the Council on the work of the fortieth session. Resolutions adopted by the Council at its sixty-second session. 13" × 8½"; 10 pp. Geneva, 1931. (*Id.*)

— Gold delegation. Second interim report. 10" × 7½"; 22 pp. Geneva, 1931. (*Id.*)

Survey of the direct and indirect means at the disposal of foreign buyers to enable them in a number of countries to ascertain the quality of the goods acquired by them. 13" × 8½"; 153 pp. Geneva, 1930. 5s. 6d. (*Id.*)

Treatment of foreigners, International Conference. Index to the proceedings. First session. 13" × 8½"; 28 pp. Geneva, 1930. (*Id.*)

Unification of laws on bills of exchange, promissory notes and cheques, International Conference. 13½" × 8½"; 19 pp. Geneva, 1931. (*Id.*)

— Index to the records of the first session. First session: bills of exchange and promissory notes. 13½" × 8½"; 34 pp. Geneva, 1931. (*Id.*)

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**Imports.**—Declared value of merchandise imported into the United Kingdom in the years ended December 31, 1928, 1929, 1930.

Countries from which consigned.	1928.	1929.	1930
	£'000.	£'000.	£'000.
Russia .....	21,576	26,487	34,245
Finland .....	13,240	14,945	12,641
Sweden .....	22,050	25,709	22,585
Norway .....	12,013	14,149	11,976
Denmark, including Faroe Islands .....	53,057	56,178	54,121
Poland, including Dantzig .....	5,781	6,908	7,947
Germany .....	63,726	68,818	65,341
Netherlands .....	42,944	42,372	39,543
Java .....	8,078	10,196	6,586
Belgium .....	43,401	44,019	38,348
France .....	60,621	56,549	49,186
Switzerland .....	14,361	13,741	12,640
Portugal .....	3,676	4,216	3,653
Spain .....	18,270	19,074	16,645
Italy .....	15,766	16,800	15,005
Czechoslovakia .....	8,189	6,676	6,393
Greece .....	3,129	2,526	2,037
Roumania .....	1,763	2,965	4,727
Turkey, European and Asiatic, including Smyrna and Armenia .....	2,656	2,245	1,878
Egypt .....	26,337	23,583	13,910
China .....	11,974	12,157	9,914
Japan .....	8,732	9,132	8,064
United States .....	188,448	195,980	153,610
Cuba .....	10,240	7,934	6,871
Mexico .....	2,369	2,690	2,886
Peru .....	6,710	6,462	4,483
Chili .....	9,104	10,615	7,347
Brazil .....	4,685	7,293	8,132
Uruguay .....	7,026	5,651	7,382
Argentine Republic .....	76,789	82,447	56,744
Other countries .....	65,302	63,406	55,858
<i>Total—Foreign Countries</i> .....	832,013	861,923	740,698
<b>BRITISH POSSESSIONS.*</b>			
Irish Free State .....	45,147	45,087	42,953
British West Africa .....	11,458	11,386	8,173
Union of South Africa .....	24,235	24,417	20,343
British East Africa .....	5,936	4,944	4,470
British India, with Burma .....	64,473	62,845	51,058
Straits Settlements and Federated Malay States .....	12,416	17,609	11,400
Ceylon and Dependencies .....	13,773	15,150	13,518
Australia .....	54,413	55,648	46,495
New Zealand .....	47,274	47,727	44,939
Canada .....	57,143	46,410	38,160
British W. Indies, with Bahamas .....	5,344	5,327	5,139
Other Possessions .....	21,973	22,292	17,494
<i>Total—British Possessions</i> .....	363,585	358,842	304,142
Total—Foreign Countries and British Possessions .....	1,195,598	1,220,765	1,044,840

\* Including Protectorates and Mandated Territories.

**Exports:** Declared value of U.K. Produce and Manufactures, and of Imported Merchandise, exported from the United Kingdom in the years ended December 31, 1928, 1929, and 1930.

Countries to which consigned.	1928.		1929.		1930.	
	Exports.	Re-exports.	Exports.	Re-exports.	Exports.	Re-exports.
	£'000.	£'000.	£'000.	£'000.	£'000.	£'000.
Russia .....	2,716	2,085	3,743	2,798	6,790	2,556
Finland .....	3,601	510	3,363	530	2,415	430
Sweden .....	9,712	1,239	10,548	1,156	10,073	869
Norway .....	7,928	449	9,858	469	12,933	342
Denmark,* with Faroe Islands .....	9,760	782	10,670	829	10,249	742
Poland, including Dantzic ...	5,253	829	4,505	779	3,564	617
Germany .....	40,947	26,392	36,967	23,253	26,830	17,312
Netherlands* .....	21,802	4,843	21,818	5,212	18,848	4,154
Java .....	7,016	109	6,642	90	4,510	91
Belgium* .....	17,002	10,348	19,413	9,205	15,062	6,540
France* .....	25,157	18,560	31,663	17,517	29,692	14,532
Switzerland .....	7,921	1,311	6,424	1,168	5,187	1,097
Portugal* .....	3,716	357	3,632	358	3,359	428
Spain* .....	9,804	645	12,055	486	9,321	527
Italy,* including Fiume .....	14,353	2,116	16,000	1,579	13,832	957
Czechoslovakia .....	2,168	178	2,101	136	1,731	116
Greece .....	4,850	150	4,921	159	3,732	196
Roumania .....	2,989	72	2,317	58	1,947	39
Turkey, European and Asiatic, incl. Smyrna and Armenia...	2,738	144	2,825	121	1,868	73
Egypt .....	11,186	198	12,576	265	9,808	192
China† .....	15,724	135	14,029	117	8,572	86
Japan† .....	14,536	265	13,435	207	8,229	168
United States .....	46,666	22,064	45,558	16,458	28,716	11,247
Cuba .....	1,649	44	2,027	54	1,283	32
Mexico .....	2,800	54	2,538	39	2,434	30
Peru .....	1,954	85	2,007	86	1,443	56
Chile .....	5,128	257	9,196	397	5,913	321
Brazil .....	16,034	391	13,383	322	7,955	172
Uruguay .....	3,106	55	3,723	52	3,560	58
Argentine Republic.....	31,210	564	29,074	603	25,270	444
Other countries .....	46,485	2,273	47,887	1,937	37,274	2,031
<i>Total—Foreign Countries ...</i>	<i>395,911</i>	<i>97,504</i>	<i>404,898</i>	<i>86,510</i>	<i>322,450</i>	<i>66,455</i>
<b>BRITISH POSSESSIONS.</b>						
Irish Free State .....	35,080	9,641	36,078	10,220	34,498	9,800
British West Africa .....	14,827	1,652	12,316	1,634	10,730	1,184
Union of South Africa .....	31,705	1,608	32,786	1,576	26,603	1,244
British East Africa .....	5,048	136	4,989	133	4,525	111
British India, with Burma ...	83,900	1,168	78,227	1,145	52,944	1,314
Straits Settlements and Federated Malay States ...	14,991	380	15,493	420	10,401	304
Ceylon and Dependencies .....	5,962	237	5,920	217	3,999	162
Australia .....	55,654	2,284	54,235	2,105	31,661	1,392
New Zealand .....	19,288	763	21,393	793	17,868	764
Canada .....	34,466	2,563	35,008	2,503	28,904	2,110
Brit. W. Indies, with Bahamas	5,111	324	5,043	311	4,749	297
Other Possessions .....	21,636	2,023	22,963	2,005	21,161	1,843
<i>Total—British Possessions</i>	<i>327,668</i>	<i>22,779</i>	<i>324,451</i>	<i>23,062</i>	<i>248,103</i>	<i>20,525</i>
<b>Total — Foreign Countries and British Possessions ...</b>	<b>723,579</b>	<b>120,283</b>	<b>729,349</b>	<b>109,702</b>	<b>570,553</b>	<b>86,980</b>

\* Excluding colonies.

† Excluding Hong Kong, Macao, and leased territories.

‡ Including Formosa and leased territories; excluding Korea.

## REGISTRATION OF THE UNITED KINGDOM.

## No. I.—ENGLAND AND WALES.

BIRTHS, DEATHS AND MARRIAGES—To 31st DECEMBER, 1930.

A.—*Serial Table of BIRTHS, DEATHS and MARRIAGES, returned in the Years 1924–1930, and in the QUARTERS of those Years.**Calendar YEARS, 1924–1930 :—Numbers.*

Years ....	1924.	1925.	1926.	1927.	1928.	1929.	1930.*
Births.....No.	729,933	710,582	694,563	654,172	660,267	643,673	649,430
Deaths ... ,,	473,235	472,841	453,804	484,609	460,389	532,492	455,397
Marriages ,,	296,416	295,689	279,860	308,370	303,228	313,316	314,698

QUARTERS of each Calendar Year, 1924–1930.

(I.) BIRTHS :—Numbers.

<i>Qrs. ended last day of</i>	1924.	1925.	1926.	1927.	1928.	1929.	1930.
March.....No.	185,389	175,523	173,997	166,974	167,926	160,047	158,671
June ..... ,,	187,038	186,864	181,332	170,778	170,997	169,451	170,212
September ,,	186,579	181,835	174,837	163,854	165,675	163,777	165,768
December ,,	170,927	166,360	164,397	152,566	155,669	150,358	154,779

(II.) DEATHS :—Numbers.

<i>Qrs. ended last day of</i>	1924.	1925.	1926.	1927.	1928.	1929.	1930.*
March.....No.	160,274	138,299	130,611	168,760	136,299	204,309	131,946
June ..... ,,	114,188	113,218	113,809	107,595	114,742	118,728	111,353
September ,,	90,138	95,054	90,705	92,238	93,715	96,749	96,400
December ,,	108,635	126,270	118,679	116,016	115,633	112,706	115,698

(III.) MARRIAGES :—Numbers.

<i>Qrs. ended last day of</i>	1924.	1925.	1926.	1927.	1928.	1929.	1930.*
March.....No.	47,068	46,263	46,228	47,940	45,250	54,426	48,747
June ..... ,,	81,301	81,921	78,393	84,963	84,788	75,488	88,039
September ,,	89,841	90,314	83,830	91,888	94,478	100,669	98,337
December ,,	78,206	77,191	71,409	83,579	78,712	82,733	79,575

\* Provisional.

## 352 Registrar-General's Quarterly Returns :—England. [Part II,

Annual Rates of BIRTHS, DEATHS and PERSONS MARRIED, per 1,000 PERSONS LIVING in the Years 1923-1930, and in the QUARTERS of those Years.

Calendar YEARS, 1923-1930 :—General Ratios.

YEARS.....	1923.	1924.	1925.	1926.	1927.	1928.	1929.	1930.
Estd. Popln. of England and Wales in thousands in middle of each Year	38,403,	38,746,	38,890,	39,067,	39,290,	39,482,	39,607,	39,806,*
Births .....	19·7	18·8	18·3	17·8	16·6	16·7	16·3	16·3
Deaths .....	11·6	12·2	12·2	11·6	12·3	11·7	13·4	11·4
Persons Married .....	15·2	15·3	15·2	14·3	15·7	15·4	15·8	15·8

QUARTERS of each Calendar Year, 1923-1930.

(I.) BIRTHS :—Ratio per 1,000.

Qrs. ended last day of	1923.	1924.	1925.	1926.	1927.	1928.	1929.	1930.
March .....	20·4	19·2	18·3	18·1	17·2	17·1	16·4	16·2
June .....	20·5	19·4	19·3	18·6	17·4	17·4	17·2	17·2
September ...	19·6	19·1	18·6	17·8	16·5	16·7	16·4	16·5
December ...	18·4	17·5	17·0	16·7	15·4	15·7	15·1	15·4

(II.) DEATHS :—Ratio per 1,000.

Qrs. ended last day of	1923.	1924.	1925.	1926.	1927.	1928.	1929.	1930.
March .....	13·2	16·6	14·4	13·6	17·4	13·9	20·9	13·4
June .....	11·9	11·8	11·7	11·7	11·0	11·7	12·0	11·2
September ...	9·4	9·2	9·7	9·2	9·3	9·4	9·7	9·6
December ...	11·9	11·1	12·9	12·1	11·7	11·7	11·3	11·5

(III.) PERSONS MARRIED :—Ratio per 1,000.

Qrs. ended last day of	1923.	1924.	1925.	1926.	1927.	1928.	1929.	1930.
March .....	11·3	9·7	9·6	9·6	9·9	9·2	11·1	9·9
June .....	15·7	16·8	16·9	16·1	17·3	17·3	15·3	17·7
September ...	18·0	18·4	18·4	17·0	18·6	19·0	20·2	19·6
December ...	15·9	16·0	15·7	14·5	16·9	15·9	16·6	15·9

\* Provisional figures.

B.—Special Town Table :—POPULATION; BIRTH-RATE and DEATH-RATE (Civilians) in each Quarter of 1930, in certain of the 107 County Boroughs and Great Towns.

Cities and boroughs.	Estimated population mid 1929.	Annual Rate to 1,000 Living during the thirteen weeks ending							
		March 31, 1930. (1st quarter.)		June 28, 1930. (2nd quarter.)		Sept. 27, 1930. (3rd quarter.)		Jan. 3, 1931. (4th quarter.)	
		Births.	Deaths.	Births.	Deaths.	Births.	Deaths.	Births.	Deaths.
107 county boroughs and towns	19,661,240*	16.8	13.6	17.5	11.3	16.8	9.4	15.6	11.6
Including—									
London (Met. Bs.)	4,417,900*	16.3	13.7	16.3	10.8	15.8	9.3	14.6	11.7
West Ham C.B.	307,600	19.6	13.4	18.5	10.4	18.4	9.1	16.3	10.3
Croydon C.B. ...	222,300	14.3	11.8	17.6	10.4	16.4	8.4	14.8	10.5
Brighton C.B. ...	146,800*	13.4	15.5	13.6	11.1	14.6	9.8	11.8	11.9
Portsmouth C.B.	242,000*	15.9	14.6	17.0	11.0	16.9	9.9	15.5	10.8
Bristol C.B. ....	391,000*	15.3	13.1	16.4	11.0	16.4	9.2	14.9	11.6
Cardiff C.B. ....	224,000*	17.0	13.9	17.7	11.4	17.3	8.5	15.7	11.0
Swansea C.B. ....	162,700	18.0	13.1	19.6	12.5	19.1	8.9	16.2	11.0
Wolverhampton C.B.	134,300	18.6	12.9	18.8	10.5	17.4	8.3	17.5	10.6
Birmingham C.B.	968,500	17.4	12.8	19.0	10.6	18.2	9.0	16.7	10.9
Norwich C.B. ....	124,900*	15.1	11.8	17.4	11.1	15.2	9.8	15.0	10.9
Leicester C.B. ....	245,200*	16.0	13.1	16.8	10.9	15.3	9.4	14.9	10.5
Nottingham C.B.	266,800	16.9	13.9	18.5	11.7	17.2	11.2	15.7	13.8
Derby C.B. ....	140,500*	17.6	13.6	18.9	10.3	16.8	9.6	15.6	11.2
Birkenhead C.B.	157,600	17.2	13.9	20.0	10.6	17.5	8.7	16.8	11.0
Liverpool C.B. ...	869,500	22.5	14.7	22.8	12.3	21.3	9.9	20.3	13.9
Bolton C.B. ....	181,500	14.6	14.0	14.9	12.4	13.3	10.1	12.4	11.6
Manchester C.B.	746,500	17.7	15.6	18.6	13.0	17.0	10.2	15.7	12.5
Salford C.B. ....	235,600	16.9	14.1	18.0	13.4	16.7	10.0	14.1	11.8
Oldham C.B. ....	142,500	12.9	16.2	14.4	13.7	13.5	11.0	12.6	12.4
Burnley C.B. ....	100,200	13.8	14.6	13.9	12.0	13.9	9.7	12.5	13.5
Blackburn C.B. ...	125,300	14.1	14.2	12.0	13.3	12.7	10.5	12.1	12.7
Preston C.B. ....	126,100	15.7	15.3	16.5	10.8	16.0	9.6	14.2	11.6
Huddersfield C.B.	113,100	13.8	14.9	15.1	13.5	12.0	11.0	12.6	12.5
Halifax C.B. ....	97,400*	14.8	17.2	14.9	15.1	12.2	11.2	11.3	13.0
Bradford C.B. ...	294,605	15.2	14.9	15.7	14.3	15.7	10.7	14.0	13.6
Leeds C.B. ....	478,500	16.0	13.8	16.7	11.7	16.1	10.1	14.6	13.0
Sheffield C.B. ...	518,000*	15.0	12.0	15.8	10.8	14.6	9.3	15.0	10.3
Hull C.B. ....	307,500	21.0	13.6	21.5	11.9	20.3	10.2	19.3	14.2
Sunderland C.B.	184,000	22.2	16.7	23.8	13.7	23.3	10.2	23.3	13.0
Gateshead C.B. ...	122,600	20.6	14.2	21.6	13.0	23.0	9.8	20.0	12.1
Newcastle-on-Tyne C.B.	283,400*	17.3	14.5	18.9	11.8	19.6	10.1	17.5	11.9

\* Excluding non-civilians.

Note.—The 107 great towns are those with populations exceeding 50,000 persons at the Census of 1921; before the second quarter of 1927 the figures referred to 105 towns only.

## No. II.—SCOTLAND.

## BIRTHS, DEATHS AND MARRIAGES IN THE YEAR ENDED

DECEMBER 31, 1930.

I.—Serial Table :—Number of BIRTHS, DEATHS and MARRIAGES in Scotland, and their Proportion to the Population estimated to the Middle of each Year, during each Quarter of the Years 1926–1930 inclusive.

	1926.		1927.		1928.		1929.		1930.	
	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.
<i>1st Quarter—</i>										
Births .....	26,170	21·6	24,775	20·5	24,252	19·9	23,449	19·5	23,684	19·7
Deaths ...	17,928	14·8	19,437	16·1	19,387	15·9	26,386	21·9	19,055	15·8
Marriages	7,818	6·5	7,348	6·1	7,385	6·1	6,735	5·6	7,298	6·1
<i>2nd Quarter—</i>										
Births .....	26,996	22·1	25,116	20·6	25,723	21·1	24,380	20·0	24,816	20·4
Deaths ...	17,008	13·9	15,812	13·0	16,567	13·6	15,895	13·1	15,889	13·1
Marriages	7,682	6·3	7,931	6·5	7,907	6·5	8,125	6·7	8,283	6·8
<i>3rd Quarter—</i>										
Births .....	24,821	20·1	23,496	19·1	23,444	19·1	23,053	18·7	22,951	18·7
Deaths ...	12,866	10·4	13,641	11·1	13,458	10·9	13,283	10·8	13,354	10·9
Marriages	8,409	6·8	9,093	7·4	9,238	7·5	9,694	7·9	9,532	7·7
<i>4th Quarter—</i>										
Births .....	24,462	19·8	23,285	18·9	23,403	19·0	21,998	17·9	23,087	18·8
Deaths ...	15,978	12·9	16,940	13·7	15,859	12·9	15,353	12·5	15,985	13·0
Marriages	7,335	5·9	8,181	6·6	8,427	6·9	8,445	6·9	8,210	6·7
<i>Year—</i>										
Population	4,903,300		4,894,700		4,888,700		4,896,600		4,879,700	
Births .....	102,449	20·9	96,672	19·8	96,822	19·8	92,880	19·0	94,538	19·3
Deaths .....	63,780	13·0	65,830	13·5	65,271	13·3	70,917	14·5	64,283	13·2
Marriages	31,244	6·4	32,553	6·7	32,957	6·7	32,999	6·8	33,323	6·8

II.—*Special Average Table:—Number of Births, Deaths and Marriages in Scotland and in the divisions of the counties during each Quarter of 1930, and their proportion to the population.*

Registration group of districts.	Total Births.		Deaths.		Marriages.	
	Number.	Per 1,000 of population.	Number.	Per 1,000 of population.	Number.	Per 1,000 of population.
<i>1st quarter—SCOTLAND</i>	23,684	19·7	19,052	15·8	7,298	6·1
Northern division ...	303	14·0	358	16·5	110	5·1
North Western div.	566	15·7	628	17·4	172	4·8
North Eastern div.	2,181	20·2	1,591	14·7	616	5·7
East Midland div. ...	3,082	17·5	2,704	15·4	954	5·4
West Midland div. ...	1,785	17·8	1,413	14·1	528	5·3
South Western div....	11,753	21·7	8,806	16·3	3,536	6·5
South Eastern div. ...	3,183	18·1	2,762	15·7	1,150	6·5
Southern div. ....	831	18·7	790	17·7	232	5·2
<i>2nd quarter—SCOTLAND</i>	24,816	20·4	15,886	13·1	8,283	6·8
Northern division ...	338	15·4	315	14·4	88	4·0
North Western div.	554	15·2	556	15·2	150	4·1
North Eastern div.	2,370	21·7	1,418	13·0	810	7·4
East Midland div. ...	3,357	18·9	2,312	13·0	1,125	6·3
West Midland div. ...	1,954	19·3	1,205	11·9	543	5·4
South Western div....	12,105	22·1	7,066	12·9	3,887	7·1
South Eastern div. ...	3,261	18·3	2,362	13·3	1,329	7·5
Southern div. ....	877	19·5	652	14·5	351	7·8
<i>3rd quarter—SCOTLAND</i>	22,951	18·7	13,353	10·9	9,532	7·7
Northern division ...	327	14·7	290	13·1	102	4·6
North Western div.	601	16·3	467	12·0	145	3·9
North Eastern div. ...	2,215	20·1	1,236	11·2	843	7·6
East Midland div. ...	3,116	17·3	1,962	10·9	1,334	7·4
West Midland div. ...	1,691	16·5	989	9·7	646	6·3
South Western div....	11,021	19·9	5,814	10·5	4,599	8·3
South Eastern div. ...	3,133	17·4	2,041	11·4	1,562	8·7
Southern div. ....	847	18·6	554	12·2	301	6·6
<i>4th quarter—SCOTLAND</i>	23,057	18·8	15,985	13·0	8,210	6·7
Northern division ...	317	14·3	331	14·9	124	5·6
North Western div.	566	15·3	550	14·9	203	5·5
North Eastern div.	2,221	20·1	1,440	13·0	871	7·9
East Midland div. ...	3,111	17·3	2,350	13·1	1,063	5·9
West Midland div. ...	1,766	17·2	1,151	11·2	494	4·8
South Western div....	11,230	20·3	7,233	13·1	3,883	7·0
South Eastern div. ...	3,101	17·3	2,316	12·9	1,231	6·8
Southern div. ....	775	17·1	594	13·1	340	7·5

*Population of Scotland.*

Population.	Scotland.	Northern division.	North Western division.	North Eastern division.	East Midland division.	West Midland division.	South Western division.	South Eastern division.	Southern division.
By Census of 1911	4,760,904	105,997	164,636	467,533	712,146	386,312	2,033,521	700,577	190,382
" 1921	4,882,497	95,718	153,273	450,441	729,985	423,133	2,137,619	704,011	188,297
Estimated to mid 1930 ...	4,879,700	88,000	146,600	438,100	714,000	406,200	2,193,500	713,000	180,300



## No. III.—NORTHERN IRELAND.

NORTHERN IRELAND.—*Number of Births, Deaths and Marriages for each Quarter of 1930 and their Proportion to the Population.*

	Births.		Deaths.		Marriages.	
	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.
1st quarter ...	6,359	20·4	5,265	16·9	1,442	4·6
2nd „ ...	6,999	22·5	4,286	13·8	1,964	6·3
3rd „ ...	6,513	20·9	3,486	11·2	2,225	7·2
4th „ ...	6,082	19·6	4,134	13·3	—	—
Total for year 1930	25,953	20·9	17,171	13·8	—	—

Population of Northern Ireland, estimated provisionally to mid 1930 (inclusive of military):—1,244,000.

	Births.		Deaths.		Marriages	
	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.
<i>1st quarter—</i>						
Total rural districts	2,662	17·2	2,705	17·5		
Total co. boroughs and urban dists.	3,697	23·1	2,560	16·0		
Belfast C.B. ...	2,446	23·6	1,656*	16·0		
Londonderry C.B.	273	24·2	196	17·4		
<i>2nd quarter—</i>						
Total rural districts	3,177	20·6	2,266	14·7		
Total co. boroughs and urban dists.	3,822	23·9	2,020	12·6		
Belfast C.B. ...	2,526	24·4	1,297*	12·5		
Londonderry C.B.	301	26·7	151	13·4		
<i>3rd quarter—</i>						
Total rural districts	2,899	18·8	1,844	11·9		
Total co. boroughs and urban dists.	3,614	22·6	1,642	10·3		
Belfast C.B. ...	2,292	22·1	1,032*	10·0		
Londonderry C.B.	318	28·2	139	12·3		
<i>4th quarter—</i>						
Total rural districts	2,599	16·8	2,008	13·0		
Total co. boroughs and urban dists.	3,483	21·8	2,126	13·3		
Belfast C.B. ...	2,294	20·6	1,466*	13·2		
Londonderry C.B.	298	24·6	168	13·9		

\* Including deaths of persons admitted from Belfast into institutions outside the co. borough, numbering 77, 77, 53 and 52 in the respective quarters.

## No. IV.—IRISH FREE STATE.

*Number of Births, Deaths and Marriages in the Irish Free State for each quarter of the year 1930, and their proportion to the population.*

	Births.		Deaths.		Marriages.*	
	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.
1st quarter ...	14,475	19·7	12,666	17·2	3,968	5·4
2nd „ ...	15,231	20·7	10,727	14·6	3,121	4·2
3rd „ ...	14,851	20·2	8,442	11·5	3,489	4·7
4th „ ...	13,717	18·6	9,836	13·4	—	—
Total for year 1930	58,274	19·8	41,671	14·1	—	—

Population of the Free State estimated to mid 1930 :—2,945,000.

1930.	Births.		Deaths.		Marriages.	
	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.
<i>1st quarter—</i>						
Total rural districts	9,344	18·0	8,689	16·7		
Total urban „	5,131	23·7	3,977	18·3		
Dublin registration area ...	2,830	26·6	1,915	18·0		
Cork regisn. area	412	21·0	441	22·5		
<i>2nd quarter—</i>						
Total rural districts	9,911	19·1	7,395	14·2		
Total urban „	5,320	24·5	3,332	15·4		
Dublin registration area ...	2,852	26·8	1,613	15·2		
Cork regisn. area	444	22·6	347	17·7		
<i>3rd quarter—</i>						
Total rural districts	9,647	18·6	5,875	11·3		
Total urban „	5,204	24·0	2,567	11·8		
Dublin registration area ...	2,797	26·3	1,245	11·7		
Cork regisn. area	512	26·1	252	12·8		
<i>4th quarter—</i>						
Total rural districts	8,998	17·5	6,579	12·8		
Total urban „	4,719	21·4	3,257	14·8		
Dublin registration area ...	2,376	22·2	1,709	16·1		
Cork regisn. area	424	21·6	303	15·4		

\* Complete returns not yet available.

## No. V.—GREAT BRITAIN AND IRELAND.

## SUMMARY of BIRTHS, DEATHS and MARRIAGES, in the Year 1930.

(Compiled from the Quarterly Returns of the respective Registrars-General.)

Countries.	[000's omitted.]		Births.	Per 1,000 of popula- tion.	Deaths.	Per 1,000 of popula- tion.	Mar- riages.	Per 1,000 of popula- tion.
	Area in statute acres.	Popula- tion middle 1930, estimated						
		No.	No.	Ratio.	No.	Ratio.	No.	Ratio.
England and Wales ... }	37,340	39,806	649,430	16·3	455,397	11·4	314,698	7·9
Scotland ...	19,462	4,880	94,538	19·3	64,283	13·2	33,323	6·8
Northern Ire- land ...	3,488	1,244	25,953	20·9	17,171	13·8	—	—
Great Britain and North- ern Ireland }	60,290	45,930	769,921	16·8	536,851	11·7	—	—
*Irish Free State ... }	17,254	2,945	58,274	19·8	41,671	14·1	—	—

\* Complete returns not yet available.

**JOURNAL**  
**OF THE ROYAL STATISTICAL SOCIETY**  
**PART III, 1931.**

THE FORTHCOMING CENSUS.

A Discussion, opened by MR. S. P. VIVIAN, Registrar-General of  
England and Wales, at the meeting of the Royal Statistical  
Society, March 17, 1931.

The PRESIDENT, SIR J. C. STAMP, G.B.E., LL.D., D.Sc., in the Chair.

MR. VIVIAN said: In opening this discussion upon the subject of the forthcoming Census I wish to take the first opportunity which has been available to me of expressing the thanks of the Census administration to the Society and the Committee appointed by it for their valuable Report upon the Census and the recommendations which it contains. I propose to take that Report as the text for my observations, not only by way of indicating the reactions of the Census administration to the Society's advice, but also because, as it appears to me, this selection of subject-matter is one which may furnish material for a lively and interesting debate.

I must first indicate how the stage was set for the consideration of the Society's advice. The 1921 Census was very full, in view of the events of the preceding decennium. In addition to the staple subjects of Sex, Age, Marital Condition, Birthplace, Nationality, etc., it included for the first time a completely dual enquiry as to Occupation and Industry, an enquiry as to Workplace, and a very elaborate enquiry as to "Dependency." The situation has been substantially altered by the decision to establish a quinquennial series of Censuses hereafter. It could hardly be expected that, in the present state of the national finances, the decision involved the taking of two Censuses on a full decennial scale within a ten years' period. The fact that a further Census will occur within five years has made it unnecessary to include enquiries making contingent provision for

the needs of a full ten years' period, as hitherto. Further, it has appeared necessary to expedite the tabulation for a similar reason. All these considerations pointed to the wisdom of a moderate Census programme upon the forthcoming occasion.

On the other hand, notwithstanding this necessity for a moderate programme, the proposals received for inclusion, if conceded, would have implied the retention of all the enquiries contained in the admittedly extensive programme of 1921, together with even further additions in the shape of the re-insertion of the Fertility enquiry of 1911, the newly-proposed enquiry as to "Usual Residence" and other new enquiries still. I feel it necessary to mention these circumstances in order that it may be appreciated that the adoption of all the suggestions made is obviously impracticable, and that omission implies no disrespect for the merits of the proposals put forward. It is impossible to get a quart into a pint pot. The determination of the Census programme is therefore a matter of selection. To those who are dissatisfied with the exclusion of any particular enquiry and who will, I hope, recognise that many good enquiries are bound to be excluded, the only possible line of discussion is, "which of the enquiries actually adopted would you have preferred to be excluded to make room for your own proposal."

Now as regards the Society's recommendations. I am happy to be able to start with one which has been accepted, viz. that suggesting a new enquiry as to usual residence. This has been mooted for many years on statistical and scientific grounds; and those grounds have now been reinforced by administrative considerations. The position in this respect, as in so many others, has been altered by the Local Government Act, 1929, basing Exchequer grants to local authorities upon a formula which depends in the main upon local population figures. These populations have to be estimated; and if you are estimating a population for a particular area it is necessary to know what kind of population you are attempting to estimate. Now there are two clear-cut principles or definitions of local population which could in theory be applied. The one is the mean *resident* population in the sense of those people who are normally or usually resident in the area; the other is the mean number of persons *present* in the area during the year. For some administrative purposes the latter definition would have been most suitable; but it is obviously quite impossible to obtain or estimate such a population, which would need the taking of Censuses every fortnight or every month throughout the year. This kind of population being thus ruled out, it is being found increasingly necessary to follow the only other clear and definite type of population, viz. the usually resident population. Indeed, there is reason for saying that this has always been the aim of

Census-taking, since although all previous Censuses in this country have been based upon the *de facto* system, care has always been taken to fix a date for the *de facto* enumeration when the population was most immobile and approximated most closely to a true resident population.

But to work by the criterion of resident population postulates the material for doing so; and in this Census it is proposed to obtain such material by an enquiry as to "usual residence." This material is being obtained in the first place for experimental purposes. We do not know what difference there really is between the *de facto* population as obtained by modern Census methods and a true resident population. It may be that the altered habits and customs of the people and their enormously increased mobility have made it impossible to approximate sufficiently closely to a resident population by the selection of any single date throughout the year. It may be, on the other hand, that the difference between our ordinary Census figures and a true resident population is not sufficiently great to make it worth while disturbing the existing practice. We are obtaining this information in the 1931 Census in order to enable us to judge. The other object of this enquiry is in order that we may use the material in connection with the estimates of local populations for the purposes of the new Exchequer grant system.

On both points one further observation occurs to me. There are people who seem to think that the "usual residence" enquiry is unnecessary, and adherence to a resident basis is undesirable, for the reason that the local Census populations obtained in the ordinary course will furnish a sort of half-way house between a strict resident population and the annual mean figure of persons present in the area. Unfortunately for this view nobody knows whether in one area as compared with another the population actually enumerated bears any measurable or orderly relation to either of the two principles. All that can be said is that local populations as actually enumerated contain an unknown amount of error when judged by either of the principles I have enunciated; and it is, of course, impossible to regard an unknown amount of error as a deliberate objective. The Society will remember the story of Dr. Jekyll and Mr. Hyde, in which it was discovered that the change of personality was due not to the drug which was supposed to effect it, but to an unknown impurity in a particular supply of that drug. I am reminded of this parallel when it is suggested that we should accept the purely fortuitous distribution of the ordinary *de facto* enumeration as satisfying any orderly principles.

I now come to an important group of recommendations made by the Committee as to "fertility" and "dependency". The Report

recommended an alternative method of dealing with the "fertility" enquiry. We have, of course, been faced with the impossibility of getting all these important enquiries into the limited Census programme. But apart from this there were considerations which suggested that it would be desirable, if possible, to make provision for both these important bodies of information in some other way. It would have been impossible to include both in any one Census. The supporters of both enquiries seemed to attach weight to the establishment of the particular enquiry which they favoured as a permanent source of material. It seemed useless in these circumstances to include either as a means of permanent provision of the desired material, as its existence would be so precarious—the position it occupied so marginal—that it would have been liable to exclusion on any occasion in favour of some other enquiry of greater contemporary or practical urgency.

With regard to the dependency enquiry, much of the case for its inclusion arose out of administrative objects and purposes; and arrangements were made to satisfy those objects by the provision of material from other, departmental, sources. That might not settle the question in future Censuses, but it should do so if the provision so afforded proves to be sufficient for the administrative purposes in view. Subject to this contingency the Census authorities have done what it is their duty to do in my submission, and have unloaded the Census machinery of a heavy responsibility. The same approach was made to the similar problem of the fertility enquiry. The amendment of the Birth Registration particulars was suggested by both the Society and the Eugenics Society as an alternative to the Census enquiry. It seemed preferable, again, that the material on this subject should not be liable to the risk of occasional omission from the Census programme, but definitely provided for in the form of steadily accumulating material from a permanent source. After a good deal of negotiation it was ultimately arranged that certain amendments to the birth register should be made at the first opportunity, and that this should be regarded as the source for material on fertility to be looked for in the future, and as the best means available, in the interests of this kind of study, of obtaining without risk of failure the material needed. The amendment will be limited to the entry of the ages of parents. I should have liked to have also agreed to the amendment of entering the date of marriage, but difficulties occur. The insertion of that particular in the birth register would distinguish between legitimate and legitimated persons in a manner which it was the express object of the legislature to avoid; and for that reason it has appeared impossible under present conditions to make the change. The amendment of the Register cannot be undertaken at once, but it is

hoped that it will be altered in time to enable a substantial body of material to be made available in connection with the 1936 Census figures.

I now come to the subject of the place of work enquiry. The Society's report made a suggestion as to the tabulation of workplaces, and the repetition of this enquiry was recommended from other quarters. It is a valuable enquiry, but in view of the very strict selection that has had to be made it would hardly appear to be one which we should be justified in treating as a staple enquiry, or for the sake of which we should be justified in excluding some other enquiry already arranged for.

The Society also touched in their Report on an important and difficult matter relating to the case of persons who, owing to the state of industry at the present time, are not likely ever to return to the occupation or industry which they previously followed. In the case of previous Censuses, the fringe of unemployment in any particular industry could be disregarded; the classification included those in work and those out of work, without distinction. In the present circumstances the position seems to be a little altered. We are told that a great number of people cannot get employment in their normal occupation or industry and will never revert to that occupation or industry. Some of them may be unemployed at Census time; some may be doing casual work of different kinds; others may have taken on some definite new work to which they will devote themselves for the rest of their lives. In the case of some unemployed miners, for example, the apprehension was that these people, who had not done any mining for years, and in many cases had no chance of returning to a mining occupation, would nevertheless describe themselves as miners, and the Census picture would thus be distorted. This led us to realize that there might be danger in giving the ordinary instructions that a man should state his usual or normal occupation, and that to give that instruction in the present circumstances might promote the very distortion it seemed necessary to avoid. But we must have some sort of principle to follow. It was suggested that the proper course was to record what the man was actually doing at the time, and not his "usual occupation"—that if working casually as a jobbing gardener at the Census date, he should be put down as such. This, however, is a principle with wide reactions: it has reactions upon the man with several concurrent or seasonal occupations. A man is ordinarily instructed to state the occupation by which he mainly supports himself: to depart from that, and to tell him to state the job which he is actually doing at the time of the Census, at once leads to difficulties. Very few, in the first place, are working on the Census Sunday or at the Census midnight. In the case of a man who fits in



alternate jobs throughout the whole of his time it may be difficult for him to say which job he is doing at Census time. The classification, again, would have to include the occupation of "Census enumerator," never previously recognized, and detaching some 40,000 individuals from the ordinary occupational lay-out of the people. The fact is, that by adopting this principle we should be doing violence to the real meaning of "occupation." A man does not cease to be a carpenter because he is not carpentering at the moment, or because he is unemployed. A man's occupation is not necessarily what the man is doing at a particular moment. The real question is, what *is* the man, occupationally, at the particular point of time, not what he is doing. It is, I think, true to say that a man does not shed the occupation which he has acquired until he has acquired a new occupation. That, I suggest, is the criterion. In the case of the miner who at the time of the Census is doing a gardening job, the question is whether he is doing this merely to keep going until he can get back to his ordinary work, or whether he has definitely given up any prospect of returning to mining, and is devoting himself to make a living at gardening? That, it seems to me, is the proper criterion; I agree it is a subjective criterion, but that is unavoidable, and not, I think, a disadvantage. We propose, therefore, to tell the person who has to fill up the return that if unemployed in his ordinary occupation and doing some other paid work, his statement as to his occupation should be guided by his prospects of returning to his usual occupation. That is, in short, our solution of the difficult question to which the Society drew our attention.

I have been a little puzzled by the last part of paragraph 4 of the Report. It suggests "that the information should not be confined to the bare statement of unemployment, but that particulars should be gathered as to the nature of the substituted work in those cases where a change of employment has been effected." Unemployment is not a statement of occupation, and no one is classified occupationally as employed or unemployed.

With reference to the question of speedy publication, this really involves two or three main considerations. One is the scale and extent of the tabulations which are required. The more elaborate and extensive these are, the longer, obviously, the period required for production. Another is the relation between the national and the local figures. We receive the material in batches by localities and we must build up the national figures by aggregating the local figures. Local figures are wanted for two kinds of purpose—for use by local authorities or in connection with other local activities; and, secondly, to exhibit the local distribution of figures which are of primarily national importance. These local figures, even where they are of less

importance than the national figures, must ultimately be produced. It is conceivable that we might work straight up to the national figures without delaying the operation by counting the local sub-totals, and then get the local figures by breaking down the national totals. But it is rarely that this could be done without great waste of time and money; and where economy and efficient organization point irresistibly to our getting the local figures in the course of building up the national figures, it is almost impossible to avoid doing so, thereby delaying to a corresponding extent the publication of the national figures. On the last occasion it was our set policy for good and sufficient reasons, I think, to put a large proportion of the Census statistics in the County parts; but on the present occasion this appears less necessary; and we hope that all reasonable needs will be met by some curtailment of the local tabulations, with a corresponding speeding-up of the national totals.

PROFESSOR GREENWOOD: I came into the room feeling great doubt as to whether I could say anything relevant, but after hearing the Registrar-General I am still more doubtful, because he seems to me to have covered the field very clearly, and I shall only occupy a very few minutes and refer to the points which particularly interest me as a medical statistician.

To take a general point, the Registrar-General was perhaps a little apologetic in his statement that he had not been able to accept all the suggestions made by this Society and other bodies, but on that point I think no apology is needed. There is a little confusion, I think, between good suggestions and practicable suggestions. All complex operations must be managed by a small number of people, and the final decision must be made by those who will have to control the operations: the plan they adopt may not be ideally the best plan, but to attempt to satisfy the desires of all experts would result in chaos.

With regard to the suggestion which *has* been accepted, a *de jure* enumeration is from the medical statistician's point of view, exceedingly important; I am not, however, quite optimistic about its being obtainable from the householder's schedule. In some countries where the *de jure* method is used, its adoption was facilitated by the fact that, owing to difficulties of language, much reliance could not be placed on the householder's schedule, and so more was required of the official enumerator than here. I am a little doubtful whether a really satisfactory *de jure* enumeration can be secured without putting more responsibility upon the enumerators than is, I think, contemplated.

I would add that the problem of chargeability of deaths against a particular population is a complex one, it cannot be solved by applying some general rule. If an invalid suffering, say, from cancer goes for a week's change to a seaside resort and dies there, it may seem absurd to debit that death against the local population. If general conditions of life, environment, climate, etc. play a part in the causation

of the disease, evidently the share of the seaside resort is negligible. On the other hand, if a perfectly fit visitor to the seaside town is run over and killed by a motor-car in its streets, the victim's *de jure* environment has nothing to do with the business. To reach a fair measure of the local risks we ought to relate the fatal accidents to the person-years of exposure within the area, and to do so involves the difficulty of determining a mean population to which the Registrar-General has alluded.

That brings me on to this other question of occupational classification. There are certain purposes for which you want the occupational history specified in one way, and there are other purposes for which you want it specified in another way, and the Census authorities cannot please everyone. Take, for example, a case which has come before me semi-officially quite recently. Supposing you are dealing with the mortality of the occupation of seamen, and that you can obtain a complete specification of the deaths of persons described as seamen. By going a little further you can find out how long a time has intervened between a man being afloat and his death. If you say, "In order to get the real occupational mortality we are going to exclude all deaths of seamen who have not been at sea for five years." there will be a certain number of deaths—by being run over and so on—that might have happened to anyone, and it seems unreasonable to suppose that the calling, which he left five years or so before, had anything to do with the victim's fate. But supposing the man did sustain some accident while at sea, such as being hit by a falling spar, which crippled him, that might have some bearing on his death. In the case of deaths from disease, *e.g.* plithisis, the difficulty of a time exclusion becomes very great, and so far as I can see we cannot really solve a problem of occupational hazard by a time rate. For that reason I think the difficulty of a proper occupational specification—satisfactory for *all* statistical purposes—is very great, and that once again the Census authorities must go back to what seems to be practicable.

I do not think I have from my special point of view anything further to add, I would only say that I am not quite satisfied that sufficient use is made of the material that is provided by the official Census machinery. Of recent years there has been a tendency—very laudable no doubt—to undertake more detailed volunteer censuses. I am not quite clear that the official information actually provided by the Central Census authorities has been completely utilized. I am confident that some of the additional information obtained is misleading, because, apart from material difficulties in ascertaining the facts, rapid short-period fluctuations may lead to the data being misrepresentative.

I conclude by saying that we could differ perhaps as to the expediency of various omissions, but the general principle on which the Census authorities have decided to proceed seems to me to be a rational procedure.

SIR ALFRED WATSON said that anyone reading the report of the Committee would be struck by their evident desire to do justice as

between the claims of the Dependency and Fertility statistics. If he felt a measure of personal satisfaction in the fact that the Committee came down on the side of the Dependency statistics, it was only in part because, in the course of his official duties, he had to make great use of these statistics. He felt also that if Dependency statistics could be given, they were of distinct public utility, and provided the means of answering many enquiries on subjects of wide general interest. The circumstances at the time have, however, prevented the Registrar-General from obtaining on this occasion even the Dependency statistics, and it was necessary to make up one's mind as to how to proceed without them in any enquiries in which the Dependency figures had hitherto been an indispensable element. One such enquiry had to be made in the next few years, and the result given in a report to Parliament in 1935, in connection with the working of the Contributory Pensions Scheme. Arrangements had been made with the Ministry of Health and the Scottish Health Department by which all the relevant figures as to dependency would be collected in respect of those insured men who died in recent years, and whose widows and children or whose orphans put forward claims to pensions. The family responsibility would be classified, according to age, of those who had died, whereas in 1921 a corresponding conspectus was given of the responsibility of those who were living. In 1921 the material was tabulated in such a way that a large amount of information was supplied in regard to the industries in which the fathers of families were engaged; that would not be the case now, but the main figures would be there, and it would be very interesting, if it were possible, to make a reliable comparison between the average extent of family responsibility at different periods of life in the case of the living and in the case of those who have died. It might well be, that the number of very young children born to fathers who had died at a particular age would be something less than the number in the case of the fathers who were living on the Census date. Unfortunately that possibility of comparison would be to a serious extent interfered with by the fact that one set of data would relate to the middle of 1921, and the other set of data to certain calendar years separated by eight or ten years from 1921; and there was the further difficulty created by the fact that the birth-rate for several years prior to 1921 had followed a quite abnormal course. When, however, all the difficulties were allowed for both sets of data would represent facts, and comparison of them was sure to bring out many points of interest.

Sir Alfred said that personally he had had to acquiesce in the decision of the Registrar-General, but if it should turn out that the new material was not entirely satisfactory for official purposes, it would always be possible to raise the question again in connection with the arrangements he made for the next quinquennial Census, and that was the comfort he took in being deprived of national statistics in regard to Dependency. In this connection, he hoped that the statistics that were to be provided by the two Health Departments would do more than supply material for reports to Parliament. He hoped that they would also provide material on which an interesting paper dealing with the question of Dependency could be prepared for

submission to the Royal Statistical Society. That obviously was a matter for future consideration, but it was a possibility which ought to be kept in view.

These Ministry of Health statistics would give something that the Census had never given, viz. the rate of re-marriage among widows, with reference to duration of widowhood as well as age. This was a very important element in measuring the cost of pension schemes for widows, and members would probably be surprised to learn that the only authentic data available at the present time consisted of certain statistics worked up from the experience of widows of the Crimean War deaths. He was very glad to feel that there was a prospect of getting some modern statistics on that rather important subject. Further, he hoped the new statistics would give an age distribution of old-age pensioners. At the present time some forty million pounds was spent annually on Old Age Pensions to people over seventy, but except for the fact that they were over seventy years of age, nothing has been published as to the ages of the recipients. It will be of advantage to get authoritative statistics as to the actual age distribution in the growing class of Old Age Pensioners.

Coming to the question of Fertility statistics, he was rather an iconoclast in regard to this particular group of statistics. He had the greatest possible respect for the stupendous piece of work which Dr. Stevenson accomplished on the subject after the Census of 1911, and yet in view of the enormous amount of information required from the public and the subsequent cost of tabulating it, he hoped that enquiry would not be resumed. He was very doubtful as to its practical value. People who delighted to interest themselves in eugenics and to predict the downfall of the country, less from economic or political disturbances than from the waywardness of the population with regard to the birth-rate, would no doubt be disappointed if nothing were done to satisfy their desires, but he did not believe that the activities of the eugenists would ever have any material effect upon a matter which was so absolutely personal to the individual man and woman as the birth-rate of the country. In these circumstances he could not but feel that, situated as the country was at present, and burdened as it was by inevitable taxation, it would be wrong to spend any large amount of money in reviving all the statistical work that would follow upon the re-incorporation of the Fertility question in the Census schedule.

The Committee had proposed an alternative, and the Registrar-General had indicated that to some extent their suggestions would be met at a comparatively early date in the future. Of course much of the information that they would desire to have depended upon data as to the duration of marriage, and on that point, as the Registrar-General explained, information could not be supplied. It was a little surprising that the Committee did not see an alternative to a new form of birth registration, and ask the Registrar-General for the inclusion of certain statistics in the Census tabulations which would give them very much the same thing as the new development in birth registration would provide. It would be quite possible to schedule for the country as a whole, and in geographical or occupational

distributions, the number of cases in which infants under the age of one were recorded in the Census on the same schedules with their mothers, and to record that information under the ages of the mothers. This information was given in the last Census Reports as an item in the Dependency statistics, but it could also be obtained from the truncated schedules proposed to be used in 1931. Of course adjustments were required in order to obtain the "issue rate"—by reference to the ages of the married mothers. (He was not concerned with the illegitimate birth-rate; that was but a small part of the problem and could never be the subject of very accurate statistics.) Those interested in the subject could find in the first report of the National Health Insurance Commission for the year 1912-13 (Cd. 6907, p. 595) a complete statement of how a table of issue rates with relation to the ages of married women was built up for the purposes of National Health Insurance from the Census schedules furnished in the borough of Camberwell, which was taken, in order to keep the work within reasonable compass, as fairly typical of the whole country. What had been done in one case could be done generally, and he would respectfully suggest to the Society, and through the Society to the Registrar-General, that such a table should be given in connection with the Reports on the forthcoming Census, whatever might be done hereafter to increase the information obtained on birth registrations.

DR. W. A. DALEY said he had not intended to take part in the discussion, but he would like to express his appreciation to the Fellows of the Society for their kindness in asking him to attend the meeting and hear the valuable comments made by the previous speakers, and also to thank Mr. Vivian for the interesting way in which he had put the various matters connected with the forthcoming Census. There were, however, one or two remarks he would like to make, the first being to thank the Registrar-General's Department for the speed and kindness with which they supplied special statistical figures obtained from the Census. When he was working in the north on a matter in which Professor Major Greenwood was also later interested, in connection with mortality amongst weavers and spinners, it was necessary to have information as to the exact work undertaken by various groups of cotton operatives, and the Registrar-General was able to give full information for statistical purposes on this subject. He thought it was not sufficiently known that in accordance with the Census Act it was possible to obtain figures supplementary to those published, at a very low cost, and if this knowledge were more widely disseminated the facility would be more largely used.

Dr. Daley had made a note that it would be of great value if more information in regard to seamen could be obtained in connection with the Census, but Major Greenwood had dealt with that matter; it was a subject to which a good deal of attention should be paid, as very little was known about the vital statistics of seamen, and their relationship to crews' quarters was important. It was a matter of common knowledge to those working in ports that tuberculosis was

a frequent disease amongst sailors, but owing to the fact that seamen suffering from a chronic disease often left their calling and followed other occupations, accurate statistics had not been collected and published.

There was another point in connection with the *de facto* or *de jure* enumeration. He did not know whether the Registrar-General proposed to provide instructions as to what was an "abode." It was most important that it should be realized what exactly was meant by the word "abode." In London a considerable number of people spent the greater part of the week in London and went to a country cottage at the week-end. If living in hotels during the week, the "abode" would be given as the place for the week-end. What applied to London also applied to other large towns. As the "block grants" to local authorities under the Local Government Act were to be paid on a population basis, a fruitful cause of controversy would arise.

With regard to the intention not to require information as to the work-place at the forthcoming Census,—so far as London was concerned work-place was a matter of great importance, having regard to the transport difficulties now being considered very carefully, and it would therefore be advisable to know the relationship between the place of abode and place of work. It had important implications not only from the point of view of transport, but from that of health, housing, and so on.

MR. HILTON said he would like to add his personal tribute of gratitude to the Registrar-General. He had very few comments to make. One reason advanced by the Registrar-General for the lesser need for giving the same range of statistics as was given in 1921 was that five years hence there was to be another Census. He would respectfully suggest that although it was only five years to the next Census it still remained ten years since the last one, and the need for full details was as great to-day as it was in 1921. In so far as quinquennial Censuses were the argument, the contraction would begin more properly in 1936 than in 1931. But he appreciated the Registrar-General's difficulties; perhaps the quinquennial argument was a rationalization of a position that was imposed by *force majeure*.

With regard to whether a person should be recorded according to the occupation that was being followed at the moment, or the normal occupation, Mr. Hilton admitted that he was one of those who had upheld the view that the Census ought to be a snapshot of the population at the particular moment; but the Registrar-General had won him over to the other view. It was a matter of approach and of purpose. If one had primarily in mind the industrial process—what was happening at a given moment of time—then one would want to know what occupation a man was following when the camera went "click." But the Registrar-General started out with other considerations; he thought it important, and Mr Hilton was now convinced that he was right where personal occupation was concerned, to have his eye mainly upon the individual. A man's craft was his personal possession, unaffected by what he happened to be doing at a particular

moment. At some periods in our history, more than to-day, men wore a uniform peculiar to their occupation. If in such periods the camera had gone "click" it would have recorded a man wearing the baker's uniform, and he would have gone down as a baker whatever he happened to be doing at the moment. The Registrar-General proposed to follow that principle, and to regard the occupation normally followed as more significant than the more transient fact of the momentary occupation. That was right, he now agreed, for the occupation; the industry was another matter and a much more difficult one. It might be argued that at the present time there are two and a half millions of people not belonging to any industry; but that would not be true. If one were to confine the industrial distribution to persons actually in employment on, say, the Friday preceding the Census, one would leave out, for example, dock labourers who happened not to be working on that day, even though their working lives had been and would be spent in dock service. There was, however, a considerable body of people at the present time as to whom it was very difficult to say to what industry they could rightly be described as belonging. The Registrar-General would have to consider carefully what he was going to do with these people, who for months or even for a year or two past have not been attached to any particular industry.

There was increasing need for Census totals and analysis of that large group of gainfully occupied persons corresponding to the "wage-earner" class that is catered for either under National Health Insurance or under Unemployment Insurance. It had been found difficult when using the figures of the 1921 Census to separate out in all cases employers and salaried persons in such a way as to leave totals that corresponded to that wage-earner class, in regard to which Acts of Parliament made a sharp differentiation. Perhaps the Registrar-General would consider in the course of his tabulation whether a means could be found of sorting out the wage-earner class under the industrial classification of occupied people.

MR. A. W. FLUX, who had taken the chair, said that before passing to another piece of business, he wished to refer to a remark of Dr. Daley about the necessity for further information as to the occupational and medical history of seamen. That had reminded him of certain suggestions made from time to time that the absence of reports on the health of seamen in the Merchant Navy comparable with the reports on the health of seamen in the Royal Navy implied neglect. It was a fact, of course, that a considerable proportion of seamen in the Merchant Navy were permanently occupied as seamen and associated steadily with the same employers under like conditions of work. It was no doubt known to most people that a further considerable number employed in the Merchant Navy were somewhat irregularly employed, now on one ship, now on another; at one time in one part of the world, at another time in another part, subject to entirely different risks. Some of these were exposed to risks which ultimately led to death, but no adequate information could be obtained in practice about their previous history. It was



known that there were persons who found temporary employment on ships because it was thought that it would be good for their health to have a sea voyage; in other ranks of society such a voyage would be paid for, but where men had to earn their own living, they had to take a voyage in that kind of way if at all. It did not follow that the causes that led to the death of such a man were causes that had anything to do with his work while he was a seaman, and possibly even on this question of tuberculosis there would be some qualifying consideration on that head.

It was desirable to remember always the peculiar conditions under which data relating to the medical history of seamen had to be collected and to have some patience with the fact that data as complete as those relating to the Royal Navy could not be produced in regard to this great and helpful body of men.

Mr. Flux said it only remained for him to say how fortunate it was that the Society had been able to do something unusual and take up the discussion of the Report of the Committee on the Census. It was quite a number of years since this method had been adopted at one of the monthly meetings, and it had been found to be a remarkably profitable procedure. Some views had been expressed that did not in all respects coincide with those expressed by the Committee, and that was always a healthy thing, for Committees were appointed for the purpose of serving the Society, and it was well that they should know what were the feelings of other Fellows and of others interested.

The usual procedure of a vote of thanks did not form part of the programme of the evening, as, in the strict sense of the word, a paper had not been presented, but he felt sure all would wish to express their indebtedness to the Registrar-General for opening the debate on this very important and interesting subject.

MR. A. ABABRELTON seconded the proposal, which was put to the meeting and carried unanimously.

*The Proceedings then terminated.*

As a result of the ballot taken during the meeting, the candidates named below were elected Fellows of the Society:—

The Hon. William Borthwick.  
Sidney P. Hansen.  
Tukaram Gopal Shiiname.

John Herbert Thomas.  
Henry William Wicks.

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## THE RELATIVE IMPORTANCE OF EXPORT TRADE.

By E. C. SNOW, M.A., DSc.

[Read before the Royal Statistical Society, April 21, 1931, the ex-President, Mr. A. W. FLUX, in the Chair.]

AT first sight there seems little difficulty in ascertaining the importance of the export trade as a whole in this country, and most people would no doubt be content to take the ratio of the value of the exports to the value of the total production. On closer scrutiny, however, it is found that there are many points in connection with the enquiry which require investigation if the result is to be statistically sound. A figure which has been quoted to express the importance of the export trade is 27 per cent., and the justification for it is obtained by taking a sentence in the Presidential Address given by Mr. Flux to the Society in 1929 away from its general context. Mr. Flux, in computing the National Income from data provided by the Census of Production (1924) and similar enquiries into agricultural output, pointed out that the gross value of the exports from this country in 1924 was 27 per cent. of the value of the output of agriculture and industry in that year. The general tenor of the paragraphs concerned in the address made it clear that this figure was not put forward as an indication of the relative importance of those activities directed towards export to the total remunerative activities in the country. Professor Bowley in an article in the *Economist* (February 9, 1929), working on Mr. Flux's figures, made "a rough estimate" that "between 25 and 30 per cent. of the whole product of industry, mining and agriculture is exported; of industry and mining alone the proportion is over 30 per cent." While Professor Bowley does not give sufficient details to enable his "rough estimate" method to be followed, a similar result of 25-30 per cent. can be obtained by assuming that imported materials enter into goods which are manufactured here and subsequently exported, in the same proportion as they do into the total of all goods manufactured. Reasons for doubting the justification of the assumption are provided by the fact that some of our biggest export industries have to import the greater proportion of their supplies of raw materials—the largest export industry, cotton, indeed has to import all its raw material. On the other hand, some of the biggest industries which have no export trade, e.g. public utility services, use relatively little imported materials. There are between these extremes many industries using varying proportions of imported

materials, and with varying proportions of their products exported. These facts are sufficient, however, to throw doubt on the accuracy of the assumption.

The general nature of the problem can be indicated by considering the symbolical fraction  $\frac{E}{I + A + S}$ , where  $E$  represents export,  $I$  industrial output,  $A$  agricultural output, and  $S$  other services. If our object is to compare the value of the goods exported with the value of all the goods produced in the country, we have a fraction  $\frac{e_v}{i_v + a_v}$  in which, however, we must ensure that the figures included in the numerator are properly comparable with those included in the denominator, *e.g.* if we want to compare the value at the place of manufacture or production of the articles exported, with the value of all articles produced (the figures in the Census Reports relate to values at the place of production), we must subtract an appropriate amount from the f.o.b. value of the exports (Mr. Flux subtracted 15 per cent. for this purpose). If we want to compare the value of the goods exported at the moment they leave the country with the value of all goods produced at the time they reach the consumer or place of use, we should use the f.o.b. value of the exports and add an appropriate amount to the factory (or place of origin) value of the goods produced.

If our object is to measure the wages (and salaries) involved in producing and handling goods for export in proportion to the total wages (and salaries) paid in the country we should have the fraction  $\frac{e_w}{i_w + a_w + s_w}$ , again taking care to ensure that the items included in the numerator are comparable with those included in the denominator.

If our object is to measure the wages, salaries and remuneration of capital involved in producing and handling goods for export, in proportion to the total wages, salaries and remuneration of capital employed in the country, we should have the fraction  $\frac{e_n}{i_n + a_n + s_n}$ , where the suffix " $n$ " denotes the "national net output" in producing the goods, *i.e.* the aggregate of the net outputs (in the Census of Production sense) of all sections of industry, agriculture or services whether engaged in the final process or in some preliminary process of production. In the case of  $e_n$ , the "national net output" in the exports, we have to allow for the net output of the raw material if produced in this country (*e.g.* native wool or hides), the net output of each process of manufacture, including the net output of the coal, electricity, etc. used, and finally the net output of transport and other

services between the factory and placing f.o.b. The final aggregate of net outputs or the "national net output" in the exports would, if the data were adequate and perfect, approximate to the gross value of the exports minus the value of the imported materials contained in the exports. The latter has been termed the "net exports." The distinction between "national net output" and "net exports" is mainly one of method. The former is worked up from the particulars furnished of the output of individual industries, and the latter is worked back from the gross value of the exports.

Each of the last three fractions, properly calculated, may be said to give a measure of the importance of the export trade, and other fractions might be constructed which could also be said to give indications of its importance from some point of view or another. So long as it is quite clear which particular fraction is being used they all serve their purpose, but the values of the fraction vary considerably.

The first step is to discuss E, the numerator of the fraction. The value (f.o.b.) of the exports in 1924 was £801 million, made up as follows:—

Class I ...	Food, Drink and Tobacco ...	£57 million
Class II ...	Raw Materials and Articles mainly Unmanufactured ...	£106 ..
Class III ...	Articles wholly or mainly Manu- factured ... ..	£619 ..
Classes IV and V ...	Parcel Post and Live Animals ...	£19 ..

This total figure of £801 million is made up of a number of components:—

- (1) Materials, raw and semi-manufactured, imported or home-produced.
- (2) Wages and salaries paid in factories and elsewhere in working up material (imported or home-produced) in its various stages, till it reaches the form in which it is exported.
- (3) The remuneration of the capital invested in these factories, etc., in which the process work is carried on.
- (4) The wages and salaries involved in providing the means of taking the goods from the factory or place of production and placing them f.o.b.
- (5) The remuneration of the capital involved in providing the means by which the work in (4) is carried out.

The articles exported under Class I involve considerable imported materials—cocoa, sugar, tobacco, oilseeds, etc. Class II is dominated

by coal and does not involve imported materials to the same extent as in Class I, though it does contain the waste products of a number of industries which use considerable imported materials. The chief item in Class III—cotton manufactures—accounts for nearly one-third of the total, and practically all the materials for this are imported. "Materials" in the sense used in the Census of Production includes not only the actual ingredients which can be ascertained by analysis of the product, but also "all fuel, oil, gas and electricity purchased; packing materials; and materials for repairs to the firm's own buildings or plant executed by their own workpeople." For convenience, I shall refer to the two classes of materials as "Ingredient Materials" and "Non-ingredient Materials." Mr. Flux estimated that the value of the imported materials (c.i.f.) in 1924 "on which some industrial operation was subsequently undertaken" was £640 million, while the output of industry, free of duplication and of excise charges, was £2,478 million. The figure of £640 million is the amount paid to bring the imported goods to our ports, not the actual cost at the factory. If it were assumed that the imported materials were distributed among the articles ultimately exported in the same proportion (approximately 25 per cent.) as in the total of articles produced, we should have (allowing for the difference between factory value and f.o.b. value) in the exports of gross value £801 million (f.o.b.) imported materials of the value of £175 million. But this simple assumption may be wide of the truth. We can get a more accurate figure if we can determine for each article (or group of articles) entering into the export trade the value of the raw materials in it, and then take the aggregate for them all. Thus, in the case of the cotton industry, the value of the imported materials contained in the articles exported, calculated on the proportion of 25 per cent. given above works out at about £44 million. But the true figure was considerably higher, though it cannot be exactly determined. The total net imports of raw cotton and yarn in 1924 was £1111 million. The actual import during the year was not the actual physical quantity of raw material used in the production of cotton goods in that year, but an examination of the figures of stocks of raw cotton and of the exports of yarns and piece goods gives no reason for believing that the figures of imports of cotton and exports of cotton goods in 1924 differ substantially from the consumption of raw cotton and the production (for export) of cotton goods in that year. In the absence of the data necessary to make an adjustment in the figure, I shall assume that the c.i.f. value of the imported raw cotton and yarns contained in the total production of cotton goods in 1924 was £1111 million. The final report of the Census of Production on the textile trades states that the cost of all materials, free

of duplication, used by the cotton, spinning and weaving trades in 1924 was £1.42 million. This excludes materials used in dyeing and finishing, but includes fuel, oil, roller leather and other items. Some of these are directly imported, while others are made from imported materials. The question is, what must be added to the £111 million of raw cotton and yarn to cover this additional imported material. There are no data available on this point, but we are probably under-estimating these items in raising the figure of £111 million to £115 million. The gross output free of duplication for the cotton trades, including dyeing, finishing and packing, was £262 million.\* The value of the imported material contained in the final output of the cotton trades is therefore 44 per cent. The exports of cotton manufactures were £199 million f.o.b. (or £174 million at the factory), and on this basis the amount of imported materials in the exported cotton goods would be £77 million. Thus there is something of the order of £33 million to be added to the figure of £175 million given above in respect of the cotton industry alone.

The calculations of the similar additions (or subtractions) to be made for other industries is not an easy task. Most of the others use imported as well as home-produced materials, and reliable estimates can probably only be made by those having detailed knowledge of each industry. The only one I feel competent to make an estimate for is the leather industry. The estimate involves a number of complications which it would be out of place to deal with here. The total exports in 1924 were £7.1 million f.o.b., and applying the figure of 25 per cent. the amount of imported materials would be £1.5 million. The more exact method of calculation, however, leads to a figure of about £2.5 million, or nearly 70 per cent. greater.

On the other hand, however, some of the articles exported contain imported materials to an extent less than the 25 per cent. mentioned above. The most obvious case is that of coal. Except for £6 million of pit-props, practically no imported materials are used in the industry. The exports were £72 million f.o.b. Taking the average figure of 12½ per cent. as the difference between f.o.b. value and value at place of production (in the case of the coal industry, the actual difference is greater), the value at place of production was £63 million, and 25 per cent. of this is £16 million. The more exact method of calculation in this case leads to a figure of rather less than £2 million, so that there is £14 million to be set against the £33 million provided by the cotton industry. A general examination of the figures of the articles entering into the export trade, admittedly without the knowledge essential to make reliable estimates, suggests that the aggregate net amount of understatement in the figure of

\* This figure is discussed in detail in the Appendix.

£175 million referred to above as the value of imported materials involved in articles exported, is not less than £50 million, and it may well be appreciably more. Even in the case of fully manufactured articles such as apparel (exports £30 million), although the piece goods from which the apparel is made are mainly manufactured in this country, the raw materials for these goods were almost entirely imported. The total value of exports of all the textile materials (including waste products as well as apparel) was more than £340 million, and except for the native wool (not a large figure) the materials (either raw or semi-manufactured) had to be imported. Subject to correction as a result of detailed examination of the figures for each industry by experts in those industries, I consider that it is not too low to take the value of the imported materials contained in the £801 million of exported goods in 1924 at £50 million above the £175 million, or £225 million.

On the basis of this calculation the value at the ports of exit of the exported goods less the value of the imported materials used in making them was £575 million. This figure is an approximation to  $c_n$  obtained by the "net export" method. We will now approach the matter from the point of view of "national net output." This method can best be illustrated by an example. The Census of Production gives the "net output" of the boot industry at £25.0 million out of a gross value of £55.4 million, or 45 per cent. The f.o.b. value of the exports of boots was £5.0 million, corresponding to a factory value of, say, £4.4 million. If we look upon this £4.4 million of boots as a random sample of the total production of £55.4 million it would have a "net value" as regards the output of the boot manufacturer of £2.0 million. By repeating the process in respect of all other articles exported we can determine a figure for the aggregate "net value" involved in producing the articles exported in so far as it is due to the industry engaged in the final process. This aggregate, of course, will not be the same as would be obtained by applying the proportion of net output for the whole of production to the total value of the exports, since the proportion of "net output" varies considerably between the different industries. If allowance is then made for the "net output" of prior industries the resulting figure, with one or two final modifications, will be the "national net output" in the exports.

There are many points of detail requiring careful consideration in the attempt to ascertain the "net output" appropriate to the gross value of each commodity or group of commodities included in the export list, and these are referred to in the Appendix. If the value of the imported materials contained in the exports could be estimated with accuracy, this alternative method would not be

necessary. Its discussion, however, brings out some interesting points in connection with the export trade and the Census of Industrial Production, and the conception of "national net output" with reference to foreign trade may be a useful tool for certain comparative purposes, and two illustrations are given later.

The calculations in the Appendix lead to a figure of approximately £550 million as the "national net output" involved in putting the articles exported in 1924 f.o.b. The figure found above for the "net exports" was £575 million. If our data were completely adequate these two results would be approximately the same. As the data are not perfect, I will take the approximate average of the two figures, *i.e.* £560 million, as being the value of  $e_n$ —the wages, salaries and remuneration of capital concerned in some way or other in the export trade, of which the gross value in 1924 was £801 million.

The data available do not enable  $e_w$ —the wages and salaries paid in producing goods for export of total value  $e_v$ —to be readily determined.  $c$  consists of a composite collection of goods, but textiles enter very largely into it. The value of the exports of textiles (including yarns) in 1924 was £297 million out of a total of £801 million, and the "ingredient materials" for these exports were almost entirely imported. In the Final Report of the 1924 Census of Production relating to the textile trades (the only Final Volume yet published), figures are given of the wages and salaries paid in substantial samples taken from each of the twelve sections into which the textile trades are divided. These show that, taken over the whole of the textile trade, wages paid (not including salaries) were 50.8 per cent. of "net output." Similar information regarding other industries will no doubt be available when other Final Reports are published. In the meantime, however, an estimate for industry as a whole is needed. In the case of the Census of Industrial Production in the U.S.A. in 1923, the item of "Wages as Proportion of Value added by Manufacture" was 42.9 per cent. for the textile trade, and 42.6 per cent. for "all industries." If the same convenient relationship between "textile trades" and "all industries" holds for this country the proportion of wages in net output may be taken at 50 per cent. The figure of £560 million given above, however, is in excess of the "net output" in the sense used in the Census of Production, as it includes non-ingredient materials. On the other hand, the 50 per cent. does not include salaries, and these it is fairly certain exceed 10 per cent. of the wages. Allowing, however, for the factor operating in the opposite direction, I will take 10 per cent. as the combined effect of the two, *i.e.* making salaries and wages together 55 per cent. of the net output. Out of the total of £560



million, therefore, wages and salaries would account for nearly £310 million.

The values of the numerators of the various fractions previously mentioned are accordingly :

$$e_v = £801 \text{ million,}$$

$$e_n = £560 \text{ million,}$$

$$e_w = £310 \text{ million,}$$

and this concludes the discussion on the numerator of the fraction.

The first two items in the denominator relating to industry and agriculture can be taken together. Mr. Flux gives the total output of these at £2,655 million, the "net output" being £1,980 million. Adding 15 per cent. to the £2,655 million for distribution charges, the total value of the industrial and agricultural output at the place of consumption or use was £3,050 million, a figure comparable to the £801 million f.o.b. exported. From these figures is reached the 27 per cent. for the value of exports to the total production given by Mr. Flux. It represents the fraction  $\frac{e_n}{i_v + a_v}$ .

To get the total "net output" of agriculture and industry we have to add to the £1,980 million above, the 15 per cent. of the gross for distribution charges. There is nothing to add for the "non-ingredient" materials, because the output of fuel industries, public utility services, etc. is included in the total. Thus the comparison of the wages, salaries and remuneration of capital in the export trade to the corresponding total for industry, agriculture and other services is the ratio of 560 to 2,380, or nearly 24 per cent., and this represents the fraction  $\frac{e_n}{i_n + a_n + s_n}$ .

When we come to make the third comparison, that is, the ratio of the total wages and salaries involved in exports to the total of wages and salaries paid in the country as a whole, further analysis is needed. What we want to get at is the comparison of the remuneration paid in connection with exports with the total remuneration paid in the country, and we have, therefore, to bring into account every person "gainfully occupied."

In the summaries of the Preliminary Reports of the Census of Production it was estimated that for Great Britain only (not including Northern Ireland) the number of persons gainfully occupied was 14,143,000 males and 5,846,000 females, a total of 19,989,000. The Census only covered in Great Britain, however, 5,746,100 males and 1,866,700 females, a total of 7,612,800. Agriculture and Fishing in Great Britain accounted for 1,250,000 males and 100,000 females. There are, therefore, about 7,150,000 males and 3,880,000 females

"gainfully occupied" to be accounted for in Great Britain (and a further number in Northern Ireland), and we want to know the aggregate wages and salaries of these. We can first subtract those unemployed who were drawing unemployment insurance benefit, amounting in 1924 to 1,000,000 males and 270,000 females. There is also to be subtracted the numbers who were ordinarily engaged in some regular occupation, but who at the time of the censuses were out of work and not drawing insurance money, but receiving relief under the Poor Law. It does not seem possible to estimate these with any exactitude, as the figures available for England and Wales on the subject include dependents. Figures for Scotland, however, in which those of dependents are separately given, indicate that roughly 70 per cent. of the total are dependents, and we can take the same proportion to apply to England and Wales. A further difficulty is that the statistics of the numbers in relief in this country include some who may have been drawing unemployment benefit under the Insurance Act, so that there will be some overlapping in the figures. Overlooking this, I estimate that the total number to be allowed for under this heading in Great Britain was about 170,000, and I take this to consist of 150,000 males and 20,000 females. In round figures, therefore, we have to find the wages and salaries of 6,000,000 males and 3,600,000 females who were at work in 1924 in occupations not covered by censuses of the Board of Trade or the Board of Agriculture.

The Census of Population of 1921 enumerated the following classes in Great Britain, which classes were not covered by the Censuses of Output of 1924-5.

				Males (000).	Females (000).
Class	XVI. Transport	...	...	1,313	46
"	XVII. Commerce and Finance	..	..	1,702	863
"	XVIII. Public Administration	...	...	1,079	400
"	XIX. Professions	...	...	307	274
"	XX. Entertainments	...	..	88	44
"	XXI. Personal Service	...	...	571	1,075
"	XXII. Unspecified Industries	...	...	351	80

In going through the list of industries covered by the Census of Population of 1921 a few others can be noticed which apparently were not fully covered by the Census of Output of 1924-5, though in some cases they were to some extent. The chief of these are—

				Males (000)	Females (000).
Undefined Gardening	...	...	...	32	1
Dress- and Blouse-making	...	...	...	4	160

The classes referred to account together for 5,450,000 males and 3,540,000 females. If we can find the average wages and salaries

for these, therefore, we shall not be far wrong in assuming the same average for the 6,000,000 males and 3,600,000 females. It is known that certain occupations included in the above list, *e.g.* distributive services, increased at a much more rapid rate between 1921 and 1924 than industrial employment in general did, but the error in assuming that the increase in occupied people in the occupations referred to was uniform will not be large.

For the Transport class there is some accurate information of the earnings of railway staffs, embracing (both by males and females) about half the total of Class XVI. The Returns of the Ministry of Transport indicate an average of salaries and earnings for the 650,000 odd employees and staff of about £185 per year. It seems satisfactory, therefore, to take the average wages and salaries of the 1,359,000 in this class at £180 per head.

For the Public Administration class we have in the first place information furnished by the Annual Civil Service Estimates. A summary of the data provided for the Non-Revenue Departments showed total earnings in 1924-25 for 67,000 persons of £18·6 million, or an average of £277 per head. For the Revenue Departments the figures showed a total of 232,000 persons employed, receiving salaries and wages of £43·5 million, or an average of £188 per head. This group is dominated by the Postal Workers, and the remuneration referred to does not include anything for uniforms. Taking the whole of the Civil Service group, a total of about 300,000 persons received on the average £208 per annum. In addition, particulars relating to the Metropolitan Police show that the total earnings (including clothing and equipment) of 20,245 men in 1927-8 were £5,372,000, or an average of £266 per head. For the police in the remainder of the country the figure was probably smaller, but for the whole country it must have exceeded £200 per head.

I have not seen any report giving the total salaries paid to teachers in Elementary, Secondary and Technical Schools throughout the country. The Reports on Scales of Salaries published in 1927 make it clear, however, that the average of all, male and female, certainly exceeds £200 and may exceed £250. I consider that I am on the underside again in taking the average for the whole of the 1,479,000 persons in the Public Administration class at £200.

Class XVII—Commerce and Finance—is probably, for the point of view of salaries and wages, akin to the Non-Revenue Departments of the Civil Service, with a possibility that salaries run somewhat higher. In the Table on p. 21 of *The National Income* (Bowley and Stamp), figures obtained as a result of a special enquiry were given of the number of salaried persons receiving (a) over £150 per annum and (b) under £150. The information relating to salaries paid by

(1) local authorities (school teachers and others) and (2) commerce (banking, insurance and others) showed that the average salary of those receiving less than £150 per annum was slightly less for "commerce" than for "local authorities," but it is certain that the average of those earning over £150 in "commerce" is substantially greater than the average of those earning over £150 in "local authorities." The proportion of males to females in the under £150 "commerce" class for the whole of the U.K. in the Table on p. 21 of *The National Income* is only a little above 1 male to 2 females. In the over £150 sample of the "commerce" class, however, there are nearly 8 males to 1 female. In the whole of the Census Class XVII there are 2 males to 1 female. The general impression of studying the figures regarding the "Commerce and Finance" class is that I am not over-stating the case by taking the average wages and salaries at £250 per head.

I have no information regarding Class XIX—Professions—except that given in the Table on p. 21 of *The National Income*. The average of those earning less than £150 in Professions seems to be below the average of those earning less than £150 in Commerce. I shall take the average wages and salaries for the whole of Professions at £200, but I feel that it is distinctly on the low side.

For the relatively small Class XX—Entertainments—I shall also take the average at £200.

For Class XXI—Personal Service—I shall take the average of £50 per head. Females are three times as numerous as males in this class, and allowing for "Board and Lodging," £50 is on the low side even for females. It may be noted that the Table on p. 21 of *The National Income* gave £90 as the average income of males on Personal Service, and £80 as the average of females.

On the basis of the figures for the various classes adopted in the preceding paragraphs, the average wages and salaries of the 5,060,000 males and 3,302,000 females in Classes XVI to XXI is £172. The total "gainfully occupied" population to be accounted for outside "industry" and "agriculture" is 6,000,000 males and 3,600,000 females—a higher proportion of females than provided by the former figures. Making some allowance for this, however, it is still on the low side to take the average of the whole 9,600,000 at £156, making a total "net output" for them of £1,500 million.

It is to be emphasized that this figure of £1,500 million for remunerative services for those occupied in this country outside the groups covered by the Census of Production of Industry and the "Agricultural Output" does not purport to cover the same field as Classes (i) to (v) in p. 12 of Mr. Flux's Presidential Address. In his calculation of "The National Income" Mr. Flux did not, for example,

include civil and municipal service. For my purpose of ascertaining the aggregate value of all the remunerative work done and services rendered by the inhabitants of this country, and expressing the value of the work and services directed towards export as a proportion of this aggregate, it is certainly proper to include services falling under the heading of national and local government. If the wages of the caretaker (paid directly by the employer) who acts as a watchdog inside the factory against burglars is included in "net output," surely the wages of the policeman (paid indirectly by the employer) who acts as a watchman outside should be included. The salary of the statistical officer employed by a firm is very properly included in "net output" because his work is of direct advantage in promoting the efficiency of the firm. But it is a very small step from the statistical officer whose salary is paid direct to the statistical officer in Government service who provides material by which the former is enabled to perform his work more efficiently. The Government officials whose "products" are statistics of imports, exports, production, population, etc., play a definite part in facilitating the work of the industrial machine, and I have no hesitation in including their salaries in the nation's "net output." Similarly, justification of some kind or other can be found for the inclusion of all classes of national and local government servants. Bowley and Stamp in *The National Income*, working by another method, included most of the classes referred to above, but deleted expenditure by local authorities on education and Public Health, etc., amounting to rather more than £100 million. I see no reason for excluding these, however, from my total, which is intended to represent the aggregate value of all the work done and services rendered by the population. The Public Health officers are of direct assistance in facilitating productive enterprise. If some firms find it to their financial benefit to employ their own dentists (whose salaries are included in "net output" of the firm), surely the salary of a public medical staff (for which the individual employer joins with others in paying the salaries) who prevents epidemics and thus helps to maintain industrial output should be included. The case of the school teacher may be a little more distant, but the same principle seems to apply. An employer has to arrange generally for some training of the work-people he takes on, and this training is expedited by reason of the previous education they have received. It is possible that a case might be made out, however, for excluding some of this expenditure on education. The whole of the expenditure under this heading in Great Britain is £81 million, but I think it probable that the under-statements made in estimating the salaries of certain of the Census classes above cover this.

It was no part of my object in writing this paper to attempt to make a contribution on the question of the determination of the national income. The analysis I have made, however, leads me to the view that Mr. Flux was on the conservative side in estimating the value of the services which make up the rest of the national income, after the output of industry and agriculture has been allowed for. He referred to the estimates as being obviously very rough, and I think that the method I have adopted of trying to account for all those who were returned at the Census of 1921 as "gainfully occupied" (making allowance for subsequent increase of population and employment), after accounting for those included in the Census of Production of Industry and the Output of Agriculture, is worth more detailed investigation.\* The fact that the final figures reached by the two dissimilar methods (Flux £3,750 million to £4,200 million, Bowley and Stamp £4,000 million) agree so well has probably led many to think that the problem is readily solved. This is not the case, however, and further investigation into the subject by those having the knowledge and time at their disposal should lead to interesting discussions.

From the figures given it appears that the aggregate of the wages and salaries paid in the country is £1,500 million plus those paid directly in industry and agriculture, these being taken at 55 per cent. of the net output at the place of production, or a total of £2,589 million. The proportion of wages and salaries directed towards export, therefore, as a proportion of the total paid in the country is

\* Reference may be made to a section of "remunerative productive activity" which has escaped inclusion both in the Census of Production of Industry and in the "output of agriculture." The number of "butchers" at the Census of 1921 was about 130,000, and it is generally assumed that this is a distributive occupation. Although it includes distribution it is, in fact, an important remunerative manufacturing process. About 2,500,000 head of cattle and 10,000,000 sheep are bought from farmers by butchers or dealers in Great Britain each year. In addition, millions of carcasses are imported. The article sold to the public, however, is meat in a condition suitable for cooking, and the process of conversion to this from the animal as bought from the farmer employs the full time of quite a big proportion of the 130,000, and a big proportion of the time of a large number of the remainder. It is a trade comparable in size with that of bread and biscuit making, the number covered by the Census of Production in the latter group being about 150,000. This industry was dealt with in the Census of Production, its net output being £38.5 million. Basing my calculation on the value of the cattle sold off the farms (£52.7 million), and of the imported cattle slaughtered shortly after arrival, and of the proportional value of the hide to the total carcass as provided by costings, I estimate that the "net output" of the occupations between the purchase of the animal by the butcher (or its importation) and the sale of meat in retail shops was in the neighbourhood of £25 million.

the ratio of 310 to 2,589, or 12 per cent., and this is the value of the fraction  $\frac{c_w}{i_w + a_w + s_w}$ .

My estimate is, therefore, that on the average 1 in 8 of those gainfully occupied in this country were in 1924 directing their activity towards export. Out of the 18,750,000 gainfully occupied and employed about 2,350,000 in 1924 were on export work. Professor Bowley, in his article in the *Economist* previously referred to, gave the figure at 2,330,000, of whom 230,000 were salaried, but his estimate of the wages bill was substantially lower than mine.

There are two problems to which the use of "national net output" on the lines developed above could, if the data were suitable, profitably be employed. The first one is the comparison of the amount of wages, salaries and remuneration of capital involved in the manufactured articles imported compared with the corresponding amount in the manufactured articles exported. Our imports of manufactured goods are spread fairly uniformly over the twenty groups into which they are divided; the largest group in 1924—chemicals—had 13 per cent. of the total. Our exports are very unevenly distributed among the twenty groups, one of them—cotton—containing 32 per cent. of the total, a big proportion of which represents imported raw material. It seems possible, therefore, that the imports of manufactured articles involve more salaries, wages and remuneration of capital in the process of manufacture proportionately than do the exports. A certain amount of analysis of the statistics of imports and exports of manufactured articles is provided in the recently published *Statistical Tables relating to British and Foreign Trade and Industry*, and it will be useful to draw attention to them, as they indicate the class of articles in which our exports have fallen off most.

	Articles ready for Consumption.		Articles Manufactured but requiring Adaptation or Combination.		Articles partly Manufactured.	
	Imports.	Exports.	Imports.	Exports.	Imports.	Exports.
	£ m.	£ m.	£ m.	£ m.	£ m.	£ m.
1924	131.3	245.5	105.6	302.4	62.9	71.0
1928	149.0	266.8	106.6	249.3	62.2	62.8
1929	160.8	271.8	109.9	241.7	63.7	60.3

I have worked out certain figures with a view to trying to compare the "national net output" in the exports with the item which corresponds to it in the imports. I have doubt, however, regarding the

comparability of the data. For example, in the case of leather, the proportion of national net output to gross output for the exports is that for the total production of this country (see Appendix). This is based upon a particular proportion of home to imported raw materials. It is not correct, however, to assume that the proportion of exotic to native raw material involved in the case of each country sending leather here is the same as it is for the production of this country. Accordingly, it is probably not correct to calculate the "national net output" involved in our imports of manufactured articles on the same basis as our exports, and I have not proceeded with the calculations. It is important to bear in mind, however, in the comparison of the gross figures of imports and exports, that these figures do not necessarily represent the value of the work involved in manufacture.

The second problem on which information regarding "national net output" would be valuable is the comparison of the exports in one year with those in another. Our exports of manufactured articles in 1924 were £619 million and in 1930 were £440 million. But cotton goods, which accounted for £199 million in the former year, were only £88 million in the latter. On the other hand, the export of vehicles increased from £27 million to £51 million. The cotton goods exported contained a large proportion of imported raw materials, while in the case of vehicles the proportion was much smaller. The falling off in the gross figures, therefore, may have exaggerated the true decline in the amount of labour, etc. employed in export. The comparison of the "national net output" in exports in the two years 1924 and 1930 calculated in the manner shown in the Appendix would be interesting. The proportion of "national net output" to gross, however, will be considerably affected by the change in values of raw materials, and we cannot properly apply the 1924 proportions to the 1930 figures of gross exports. This problem can only be solved, therefore, when the results of the Census of Production of 1930 now being taken are available. All that can be done now is to draw attention to the importance of the matter, and to express an opinion based upon detailed examination of the data that the true loss to British trade due to decline in exports is not so great as is indicated by the comparison of the gross figures for 1924 and 1930.

There is need, I think, for looking at the whole problem of import and export trade from a new angle. The publication, for example, of the figures of value of that trade seem frequently to mislead the commentators, and deductions from comparisons of values during periods of rapidly changing prices must be made with great care. In the last few years the Board of Trade has made a great step for-



ward by publishing quarterly indices of volume of import and export trade in the various classes. A good illustration of the value of these indices is afforded by the comparison of the change in imports of manufactured articles between 1924 and 1930 with the corresponding change in the exports. Taking the gross values, the imports increased from £300 million to £307 million, or an increase of 2 per cent. The corresponding exports declined from £653 million to £466 million, or by 30 per cent. But the indices of volume show that the *quantity* of the imports actually increased by 36 per cent., while the *quantity* of the exports declined by 13 per cent. For the purpose of bringing these indices to the attention of some who may not otherwise see them, I give a summary as follows:—

*United Kingdom.*

*Index-numbers of Quantities of Imports Retained.*

	1913.	1924.	1928.	1929.	1930.
I. Food, etc. ...	—	100	101	105	106
II. Raw Materials ...	—	100	101	113	101
III. Manufactures ...	—	100	130	135	136
All Goods ...	94	100	108	114	111

*Index-numbers of Average Values of Imports Retained.*

I. Food ...	—	100	92	90	79
II. Raw Materials ...	—	100	82	78	65
III. Manufactures ...	—	100	85	85	78
All Goods ...	70	100	88	86	76

*Index-numbers of Quantities of Exports of U.K. Produce.*

I. Food ...	—	100	106	119	112
II. Raw Materials ...	—	100	90	101	85
III. Manufactures ...	—	100	108	109	87
All Goods ...	131	100	105	108	89

*Index-numbers of Average Values of Exports of U.K. Produce.*

I. Food ...	—	100	90	82	76
II. Raw Materials ...	—	100	73	73	70
III. Manufactures ...	—	100	87	85	81
All Goods ...	53	100	86	84	80

The notion of indices of quantities of imports and exports can be usefully employed to compare the movement of the surplus of imports of food and raw materials with the corresponding movement of the surplus of exports of manufactured articles, a matter previously referred to in terms of value. Representing the quantity of

the excess of imports of food and raw materials over exports in 1924 as 100, the figures for 1928, 1929 and 1930 were 103, 108 and 106 respectively. Representing the quantity of the excess of exports of manufactured articles over imports in 1924 as 100, the corresponding figures for 1928, 1929 and 1930 were 91, 90 and 51 respectively. By volume our surplus of exports of manufactured goods in 1930 was only one-half of what it was in 1924.

Though these indices of quantities represent a great step in advance in giving a picture of our import and export trade, further improvements are possible, though these can hardly become practically obtainable without the active co-operation of those having expert knowledge of individual industries. For example, it would be useful to be able to see at regular intervals what is the value of the wages and salaries and remuneration of capital involved in the exports, and to compare it with the corresponding figure in the imports. Exotic raw materials enter into our exports of manufactured goods probably to a greater extent than in the imports. The amount of wages, salaries and remuneration of capital involved in the gross value of the imports of manufactured goods, therefore, may be greater proportionately than in the exports. The list of imports and exports of manufactured goods is divided into twenty different groups which vary considerably in respect of proportions of exotic raw materials. In the hope that similar information may be provided by those competent in the different industries, I give below the information in the case of (a) leather industry, (b) boot and shoe industry. The figures are, of course, only general averages. Exact calculations\* are impossible, and many small assumptions have to be made in the details of the calculations. Assuming that the exports are a random sample of the goods produced (an assumption which is not quite true, but which affects the statistical results to only a small extent) in 1924, £1,000,000 exports of leather f.o.b. involved from the beginning to the end approximately—

£200,000 native raw materials;

£380,000 imported raw materials;

£210,000 wages and salaries, not only in producing but in transporting, provision of fuel, handling of hides and skins, etc.;

£210,000 remuneration of capital from the commencement of the handling of the raw material to f.o.b.

\* In making the calculations I have used Mr. Flux's figure of 12½ per cent. as the difference between factory value and f.o.b. value, though I think this is on the high side for the trades mentioned. If a lower figure is taken the effect will be to depress the last two items and raise the first two.

£1,000,000 exports of boots and shoes involved from the beginning to the end approximately—

- £60,000 native raw materials;
- £280,000 imported raw materials;
- £370,000 wages and salaries, not only in producing but in transporting, provision of fuel, etc.;
- £290,000 remuneration of capital from the commencement to f.o.b.

The boot figures have to take into account all that has been done in previous processes both on native raw material and imported, and in addition have to take into account imported leather. £1,000,000 of boots exported means an income to this country in some form or other of £720,000, while £1,000,000 of leather exported means an income of £620,000. In other words, an export of £6 million of boots is as useful to the country as an export of £7 million of leather.

In considering the question of export trade development, statistical analysis, though extremely useful, is not the only method to adopt, and historical perspective is also important. There is always a tendency in human affairs to extrapolate according to the law determined by the immediate past experience. If some factor doubles itself in a particular period it is often assumed that it is going to repeat itself again in a similar period subsequently. In the past hundred years the increase in the amount of trading between nations has been enormous. What justification have we, however, standing half-way between 1831 and 2031, for assuming that the development of the next hundred years will be anything like the past? I see very little. On the contrary, the slowing down in the rate of the growth of population which is already very marked in this country, and is apparent also in some other industrial countries, suggests that there may be a slowing down in due course in the development of international trading, unless new factors, unforeseen at present, appear. In a paper contributed to the Society two years ago under the title "The Limits of Industrial Employment," I attempted to show that, taken in conjunction with the extremely rapid growth of labour-saving devices this slackening in the rate of growth of the population in this country contributed a limiting factor on the growth of industrial employment. The argument has a few more adherents to-day than, judging from the discussion on the paper, it had at that time. It is, at any rate, fairly well appreciated now by manufacturers of articles for consumption in this country. Many of these, having found by experience over the past few years that the output of additional factories is no longer auto-

matically taken up by an increasing population, as it was a generation ago, are not to be tempted, either by cheap money or other inducement, to repeat their mistakes of 1920-24 and to build new factories. This so-called "lack of confidence" on their part in undertaking new enterprises or extending existing ones is in reality based upon sound foundations. A generation ago, the annual increase in population helped considerably in taking up the output from new factories as it became available, but this is no longer the case, and in this matter we differ very substantially from the United States, where the population increased by sixteen millions in the past decade.\*

I suggest that the economic historian in the distant future writing on "The Rise and Decline of International Trade from the Nineteenth to the Twenty-first Centuries" will find no justification from the data for adopting a linear or similar law of continuous upward growth, but will analyse the data into "periods." He will note a "coal period" which will overlap an "oil period," and if he is a statistician well drilled in the Pearsonian school he may try to dissect the two periods. In the "coal period" he will note great increase in international trading, not only in coal itself, but in loco-

\* A simple example to illustrate the effect of the decline in the rate of growth of our population on world trade is afforded by the statistics of our food supply. Between 1900 (average of 1899-1901) and 1912 (average of 1911-13) the wheat and wheat flour imported into this country increased from 97 million cwts. to 118½ million cwts., or at the rate of 1¼ million cwts. per year. Between 1912 and 1929 (average of 1928-30) the imports increased by only 1½ million cwts., or less than 100,000 cwts. per year. The table given by Mr. Flux in his paper last year on "Our Food Supply before and after the War" showed that our total food supplies increased between 1911 and 1926 from 22·3 million tons to 23·1 million tons, the proportion of imported cereals declining from 17·3 per cent. to 15·5 per cent., while dairy produce and fruit proportionally increased. The great change in the rate of growth of imports of wheat was only to a small extent due to substitution of other materials, but was mainly due to change in the rate of growth of population. If between 1912 and 1929 our requirements of wheat had increased at the same rate as between 1900 and 1912, our imports in 1929 would have been 148 million cwts. instead of 119½ million (average 1928-30). In the three years, therefore, we took 85 million cwts. less than would have been the case if the linear law of progress had held. Now the fall in wheat prices has been mainly attributable to the excess of world production over world consumption in 1928 and 1929, and this surplus production has been estimated by the Food Research Institute of Stamford University at about 200 million bushels, or about 100 million cwts. Eighty-five per cent of this increase in stock would not have occurred if our rate of growth of wheat consumption of 1900-1912 had continued to 1929. A substantial contributing cause to the fall in wheat prices was the inability of wheat-growers to appreciate that the main world market for their output for some years has ceased to expand. It is relatively easy now to increase production of wheat, but in face of the facts of the growth of population in this country it is difficult to get corresponding increase in consumption.

motives, bridges, steamships, etc., whose development was based on coal. He will not fail to point out that Great Britain, being abundantly provided with coal, took the predominant part in this development. In the "oil period" he will note further great increase in international trading, not merely in oil itself but in motor-cars, rubber, etc., whose development depended upon oil. In his review of this period he should not fail to observe that Great Britain, not being endowed by nature with great resources in oil, played a relatively small—but far from insignificant—part in the developments specifically associated with oil. Fifty years ago nobody could possibly have foreseen the forthcoming "oil age" or have foretold its prodigious influence on the development of trading between nations. If it had never occurred, the rate of growth of international trade in the past generation would have declined. This country might have had a bigger share of the total, and we might have had some satisfaction in that fact, but there is no justification for the view that, without the appearance of the "oil age," international trade would have continued the upward course indefinitely. In course of time, too, we must, in accordance with historical precedent, expect the "oil age" to reach its zenith, and the international trade which has been created by it to slacken in its rate of growth. It is not impossible that some new factor \* at present unforeseen, may appear before another fifty years is over and result in another "period" involving great development of international trade. But failing this it does not seem unlikely that the magnitude of international trade developed by the "oil age" also will tend to reach some limiting magnitude. The world through thousands of years has developed not continuously according to a linear law, but in "epochs" or "ages" overlapping one another. We are now in an epoch of international trading. Such trading will always continue, but there is no justification for assuming that it will develop indefinitely.

In various publications recently the fact that the proportion of international trade which is done by this country is continuously diminishing has been referred to as an indication of our commercial decline. But as other nations develop it is no more possible for us to maintain a predominant position in export trade than it is for a champion athlete as younger men develop to maintain the high proportion of winning trophies he had in the period of his supremacy. Although we have a large population we are apt to forget that we have practically only one raw material which we can readily produce in excess of our own requirements, and that this raw material—

\* This may even be a factor connected with our own coal industry by which oil will be produced on a commercial scale.

coal—is considerably less sought after by other nations than it used to be. The United States increased her total annual imports between the end of last century and 1928 by 3,350 million dollars. But of this increase only 710 million dollars was in fully manufactured goods, 760 million dollars was in semi-manufactured goods, and 1,880 million dollars in raw materials and food-stuffs in which—as she does not want our coal—we could only participate to an infinitesimal extent. Our lack of the materials required by other countries must inevitably restrict our share of international trade development. It is mathematically certain that so long as the demand is for more of such classes of goods as tea, coffee, sugar, rubber, woodpulp, newsprint, petroleum, etc., and we can only produce manufactured articles and coal, our proportion of the total trade must decline. Approximately 25 per cent. of the international trade of the world is in food-stuffs, 35 per cent. in raw materials and articles mainly unmanufactured, and 40 per cent. in manufactured articles. Our contribution to the first two groups must always be small, unless by the development of scientific discovery our coal comes in greater demand. All we can do is to get our share of the 40 per cent. represented by manufactured articles.

The fact was that up to about the period of the war the supremacy of our economic position based on coal had enabled us easily to maintain premier position as an exporting nation against the relatively weak competition which had to be faced, and to uphold a standard of life above that of other nations. It has taken us a decade to discover that export trade in the “oil age,” where the advantage of our national resources in coal is greatly reduced, is an entirely different proposition. Before the war many of our productions practically sold themselves. The buyers approached the sellers, and export trade was looked upon as being particularly remunerative. Travellers acting abroad for the sellers were, in some industries, unknown. Now the impetus is in the other direction. The seller has to seek orders from foreign customers in the face of other sellers even more anxious for orders. The significance of this great change in the nature of export trade of the type for which this country is organised to carry on is not generally appreciated. There is all the difference in the world between making goods for anxious buyers and taking part in a scramble by anxious sellers to obtain the limited orders available. The work of the seller under these circumstances can certainly be facilitated by special training in salesmanship, but this, though important, cannot by itself get to the heart of the problem. Salesmanship is an art quite as readily learnt by our competitors as by ourselves. At the bottom of all it is the cost of production which ultimately counts.

A certain proportion of the business available may be obtained by sentimental reasons, but the great bulk must go to the producer quoting the lower price. The alternatives are either to adjust costs so as to be able to quote the lowest price or be prepared to suffer contraction in export trade. Up to the present we have, mainly unconsciously, adopted the latter alternative. Even now, though we are to some extent in process of trying to adopt the former, it is doubtful whether we are, in fact, doing so, since the adjustments in wages which have been recently made are, on the whole, smaller than have been made by our chief competitors, and also have lagged behind them in time.

But it is permissible at least to express a doubt as to whether extreme anxiety to maintain export trade under the new circumstances which have developed is worth while. If it can only be done by depressing our standard of life it is worth some consideration to find out the implications involved in the alternatives, since, assuming approximate equality of skill and organisation, it is the country with the lowest standard of living which sets the pace in export trade. A few months ago the Chairman of the Federal Farm Board in the U.S.A. deliberately advised farmers in that country to give up the idea of maintaining an export trade in wheat, since this could only be done if the farmers were prepared to accept the lower standard of living existing in certain other wheat-exporting countries. But it is not much more than a generation ago that the U.S.A. was the chief exporter of wheat in the world, and as recently as 1927 sent £24 million to us. The loss of this particular export trade is not likely to cause her, as a nation, great inconvenience. Our position is strikingly different. Even so, however, it is worth debating whether the importance of export trade has not been exaggerated with us. Is national prosperity certainly dependent on constant striving to do as much export business as possible and depressing our standard of life to do so? The full consideration of this would lead very close to controversies to be avoided in this Society, but the subject ought, somewhere or other, to be debated in the light of all the data which can be brought to bear upon it. It is merely slurred over, but not dealt with, by the assertion that exports are vital to pay for the food-stuffs and raw materials which are essential to us at the present time. We are not at present suppliants for the food-stuffs grown by other nations so much as the farmers in other nations are suppliants to be permitted to market their productions here. The great disparity between the price of imported food-stuffs and exported manufactures in comparison with the corresponding pre-war prices is partly created by the anxiety of producers overseas to sell their produce, at the best price obtain-

able, in this market. Their plight without our market would be little better than our own without their food-stuffs. Important as the question of imported food-stuffs is, we are in danger of losing our perspective if we allow ourselves to develop the feeling that it is equivalent to sacrilege to contemplate any action which might restrict us in any way in buying our food supplies. Export trade statistics in some quarters seem to be viewed with the same apprehension as the figures in Football League tables, where to be top is the only measure of merit. Now that we have passed from second place to third in the export league table, and seem to stand no chance of recovering the position, we can the more readily cogitate upon the question of whether this "league" business is really worth while. I suggest that it is worth while considering the general subject of export trade from a fresh point of view. Not, how can we beat everybody else in gaining "markets," but how can we direct it with a view to meeting our national requirements in the most satisfactory manner?

The most important fact bearing upon the subject is what should we do for our food-stuffs if our exports together with all the other items on the credit side of our international account failed to pay for our imports of food-stuffs and essential raw materials? The answer already indicated seems to be that as this is far and away the most important international market for food-stuffs in the world, and that as without it a number of other countries would be in dire straits, the price of food-stuffs would be adjusted to meet our purse, and it would seem that this process is already going on. The extent to which material exports have paid for total imports in recent years, in comparison with 1910 and 1913, has been as follows :—

					%
1910	...	...	...	...	75
1913	...	...	...	...	80
1924	...	...	...	...	70
1928	...	...	...	...	67
1929	...	...	...	...	66
1930	...	...	...	...	60

As pointed out in a previous paper (*J.S.S.*, July 1921, p. 641), before the war the tendency was for our exports of merchandise to increase in importance as the means of paying for our necessary imports, but the movement has been definitely reversed. It is not possible to make an absolute estimate of what is the minimum amount of exports required in order to pay for the imports of food-stuffs and raw materials necessary (taking account of the "invisible exports"—interest on investments abroad, etc.—in addition) to maintain a particular standard of living, as this depends to a



very large extent on the price level. The lower the price level, the greater the importance of the interest on foreign investments, etc., in paying for essential imports. In the footnote\* a calculation is made, based upon (a) 1924 level of prices, (b) 1930 level, of the minimum amount of exports of material goods which would be necessary to pay for the imports of food-stuffs and raw materials required for our existence at the present level. On the basis of 1924 prices, the minimum exports would be £600-£650 million (actual exports in 1924 were £801 million), and on the basis of 1930 prices they would require to be £480-£520 million (actual exports in 1930 were £571 million). Up to the present our loss of export trade has not appreciably affected our average standard of living, as measured by the quantity of food-stuffs, etc. we have been able to buy. If prices of imported food-stuffs rise much above that 1930 level, however, while the value of the exports does not correspondingly rise, such a position cannot be indefinitely maintained.

The last thing I wish to do is to belittle the importance of our export trade. Bearing in mind, however, that as we have so very little of the produce and materials which the rest of the world wants, and that we can only develop our export trade by entering into the scramble with other countries in the manufacturing section of that trade, we shall only be able to maintain our position in that scramble if the labour costs of the 12 per cent. of our "gainfully occupied" population are comparable, in the long run, with labour costs in the other manufacturing countries joining in the export scramble. This will, in the long run, set the pace for the remaining 88 per cent., or be productive of social discontent. Instead of assuming, as we almost invariably do, that our existence depends upon getting a substantial portion of the proceeds of the scramble, we might for a

\* On the basis of 1924 prices and quantities we want £865 million of imported food, drink, tobacco, raw materials and articles mainly unmanufactured. Of the £266 million "articles wholly or mainly manufactured" it was estimated in Volume I of the Statistical Tables Relating to British and Foreign Trade and Industry (1924-30) that £56 million represented partly manufactured goods, £91 million goods manufactured but requiring adaptation or combination and £119 million fully manufactured goods. If we assume that we could manufacture the latter two items ourselves, and that we obtained the same income from overseas investments, commissions, etc. as in 1924 (£280 millions), but allowing nothing for shipping services, and that there was nothing left over for foreign investments, we should have the equation:

$$280 + X = 921 - a + b + c$$

where  $a$  is the amount of imported raw material contained in the actual 1924 exports of £801 million,  $b$  is the amount of raw material we should require to import to make up the manufactured goods (£210 million) previously imported and  $c$  the amount of imported raw material required for the exports  $X$ . It is

while, as a hypothesis, set limits to the lengths that we will go in participation in the scramble. If export is contracted, other factors in the equation of foreign trade will be affected. That equation, in approximate terms, is

$$F_I + R_I + M_I + V = F_E + R_E + M_E + D + S,$$

where  $F$  denotes food, etc.,  $R$  raw materials, and  $M$  manufactured articles, the suffix  $I$  denoting imports and  $E$  exports,  $V$  the amount invested abroad in the year,  $D$  the dividends received on foreign

estimated earlier in the paper that the value of imported raw material contained in the £801 million of exports is £240 million. This is  $a$ . Applying the same ratio of  $\frac{\text{imported raw material in exports}}{\text{total value of exports}}$ , the value of  $c$ , the imported raw

material necessary to make up exports of value  $X$  is  $0.3X$ . The nature of our imported manufactured goods is quite different from that of our exports. The latter, as is pointed out elsewhere, contains a larger proportion of imported raw material than would a random sample of the total production of industry. On the other hand, our manufactured imports are more evenly divided among the twenty classes of Group III, and for the purpose of calculating the amount of raw material it would be necessary to import in order to produce this extra £210 million of manufactured goods previously imported. I take the proportion (approximately 25 per cent.) applicable to all industry in this country. On this basis  $b$  works out at £53 million, and

$$X = £649 \text{ million.}$$

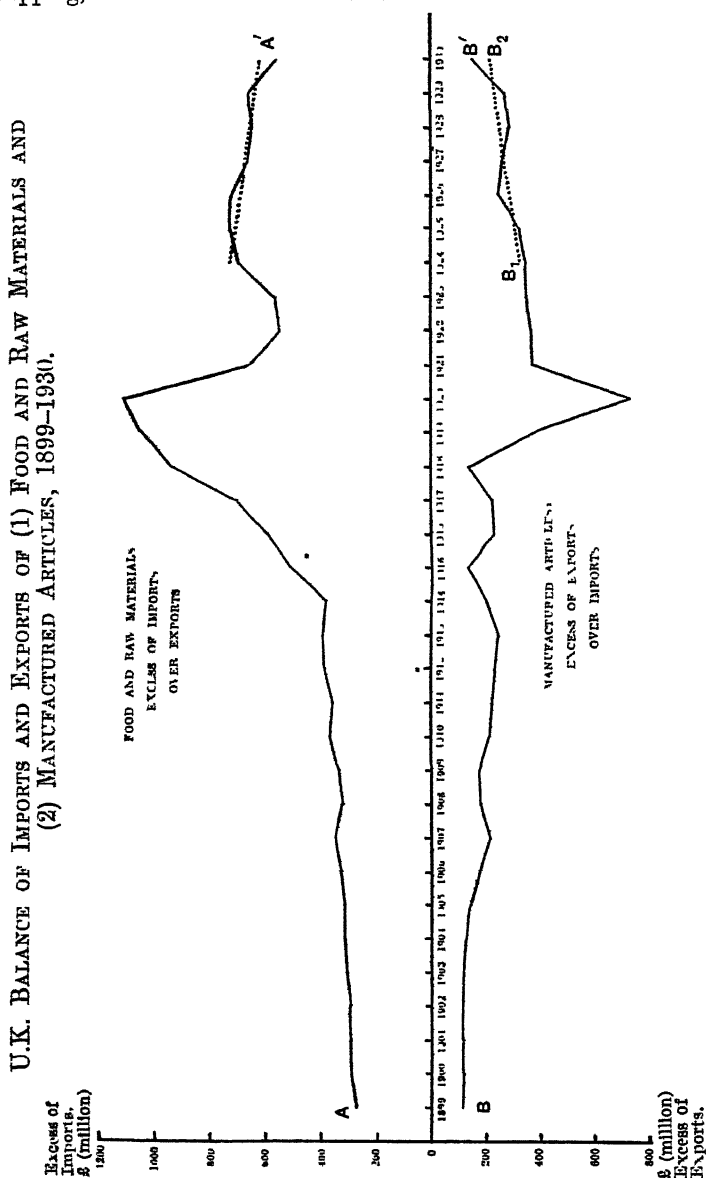
Carrying out a similar calculation for 1929,  $X$  (at 1929 values) = £514 million, while for 1930,  $X$  (at 1930 values) = £451 million. From 1924 to 1929 the average values of U.K. exports had fallen by 15.9 per cent., and from 1924 to 1930 by 19.7 per cent. Using these figures we can express  $X$  for the different years on the basis of 1924 values, and on the basis of 1930 values as follows:—

*X at 1924 and 1930 values.*

Year.	At 1924 values.	At 1930 values.
1924	649	£ Million 520
1929	610	490
1930	562	451

The average values of imports fell by 12.2 per cent. between 1929 and 1930, while the average value of exports declined by only 4.5 per cent. Thus a smaller volume of exports would have been required in 1930 to pay for the imported materials than would have been the case had the average prices of exports fallen at the same rate as those of imports. In the latter instance  $X$  in 1930 calculated at 1924 values would have been £596 million and at 1930 values would have been £479 million. The relatively close agreement of the values of  $X$  calculated on the three different years leads to the view that in order to pay for our imports of food and raw materials we must export £600–£650 million of goods calculated on the basis of 1924 prices, or about £480–£520 million on the basis of 1930 prices. Actually the total exports in 1930 were £571 million, of which £112 million was food-stuffs, raw materials and waste products. We should, therefore, on the assumptions made, require to export about £370–£410 million of manufactured goods to be able to feed, clothe and maintain the standard of living of the people in this country.

investments made in previous years, and  $S$  the net payments for shipping, financial and other services.



The equation can be written :

“ Excess of Imports of Food and Raw Materials ”  
 equals “ Excess of Exports of Manufactures ” plus  $(D + S - V)$ .

The diagram shows two lines, (a)  $AA'$  indicating the excess of imports of food and raw materials from 1899 to 1930, and (b)  $BB'$  indicating the excess of exports of manufactures in the same period. The lines of trend for the period 1924 to 1930 are also shown. I will not myself fall into the pitfall of extrapolation, but will merely mention that if the line  $B_1B_2$  (representing the excess of exports over imports of manufactured goods) is continued it would meet the axis in about 1942.

The usual proposal for modifying the equation of foreign trade is the restriction of  $M_I$  by means of import tariffs. As all the terms are variables, it is impossible to say which of the other items— $M_E$ ,  $S$ ,  $V$ , or the others—in the equation would be most affected by such restrictions, though it is generally assumed that  $M_E$  would be. As there are many factors operating, however, this assumption does not seem to be fully justified. The process through which these factors operate is that of the foreign exchanges. Economic theory seems to be quite out of touch with the realities of business in dealing with this aspect of the subject. Professor Taussig in his *International Trade* (1927) gave his views on this in the following words: "It is not within the scope of this work to follow the details of the mechanism of the foreign exchanges. The intricacies of the subject . . . need the less attention here because *they are of but little significance for the broader problems of international trade.*" Such a statement must cause those in practical touch with international trade real astonishment. It seems inconceivable that any theory of international trade which is to have any resemblance whatever to the realities of the problem can ignore the foreign exchanges. Many of our notions of international trade, however, were developed at a time when the exchanges fluctuated only between relatively narrow limits, and we can see the association between variation in exchanges and the physical movements of trade far better now that we have had some years of experience of wide variations. Take, for example, the proposition "Imports pay for Exports." Using the term in the wide sense over a substantial period, *e.g.* one year, this is a mere truism expressing the equation set out above. But there is no justification for arguing from this general proposition to the particular one that if there is a specific increase or decrease in the imports there must be a corresponding specific increase or decrease in the exports. When it is fully understood that all international trade operates through the foreign exchanges the truth of this statement is readily recognized. What happens when an article is imported, say from the United States, is that the seller on the other side wants dollars, as he has to pay his expenses in dollars. The currency of the buyer on this side, however, is sterling. Somewhere or other

in the course of carrying through the negotiations, therefore, sterling must be exchanged for dollars—either by one of the principals operating on the exchange or an agent. Whether the transaction is looked upon as selling sterling or buying dollars, it must tend to make sterling somewhat cheaper in terms of dollars. On any day there is a very large number of transactions between sterling and dollars, and the effect of any one transaction can only be expressed in the language of the differential calculus.\* This tendency to make sterling somewhat cheaper may have reactions of various kinds. It will have a tendency to make it a little easier for somebody in America to buy British goods. But equally it will have a tendency to make anybody who is compelled to send a dollar remittance to the States at that time pay slightly more for it, or a tendency to make anybody who is compelled to remit in the reverse direction to pay slightly less for it, or a tendency to alter slightly the amount which a tourist from one country gets when exchanging his money in the other. One possible effect of such a transaction might be to affect slightly the prices at which many other transactions are carried through, without, however, affecting the volume of these transactions. Only a small proportion of international trade is in respect of articles sold at fixed prices, *e.g.* motor-cars. If the price of an American car sold in England is at a fixed sterling price, fluctuations of the dollar exchange do not affect the number exported, but only the return in dollars to the producer. But there are other articles which may be termed “marginal” from the point of view of international trade, the extent of their entering into that trade varying according to fluctuations in the exchange. Consignments of leather, for example, having been exported from this country to the United States because the price level over there looked favourable, have been subsequently returned because movements in the exchange made it profitable to do so. It is the movements of commodities of this nature that may be affected by a variation in the exchange. The variation may result in an adjustment of price or it may prevent a transaction that would otherwise be carried through, or make possible transactions that would otherwise not be contemplated. Since sterling has been at a high premium in Australia, for example, not only have goods normally exported been available on this side cheaper by reason of the exchange, but goods which otherwise

\* If the equation representing the trade balance is differentiated, every term on each side being a variable whose value is affected by a multitude of relatively small factors, it will be seen how unjustified is the assumption that  $\delta(M_1) = \delta(M_2)$  or  $\delta(M_2 + S)$ . An increment (or decrement) in any of the terms of the equation becomes intermingled with many other increments (or decrements) of the other terms (or even the same) through the general reservoir of the exchanges.

would never have been exported have been sent out. (It may be remarked in passing that the importance of the fall in the exchanges in Argentine, Australia and other food and raw material producing countries in producing the last, say, 20 per cent. of the fall in prices recently, has not been properly appreciated. It may be that the first impetus to the fall in the exchanges was given by the early downward movements in prices, but subsequently the lower exchanges themselves produced further declines in prices. No account of the unprecedented drop in prices in 1930 will be complete which does not analyse the association between variation in foreign exchanges and prices.) There is a certain analogy between the "exchange dumping" of foodstuffs in this country in the past year and that of manufactured articles from certain continental countries a few years ago.

If we recognize that every foreign trade transaction must have some reflection in the reservoir of foreign exchanges, and that this reservoir is fed in addition by all sorts of other transactions, and that there is a constant interaction between these transactions by reason of their common connection with the foreign exchanges, we get, I consider, a basis for a theory of foreign trade having more resemblance to the practical realities of the problem than those hitherto developed. I am quite unable to see the justification for the argument that because the general equation of foreign trade holds good and is expressed in the simple though misleading form "Imports pay for Exports," it necessarily follows that a specific import (*e.g.* a motor-car) must be followed by a specific charge on the other side. If it were true, we might aim at banishing influenza and increasing our exports at the same time by the simple device of buying up all the oranges in the world.

In the last few weeks the subject dealt with in this paper has become one of public discussion, but many of the contributions have little statistical basis, and it may not be out of place to enter a plea for the more practical examination by statistical investigation of the economic problems relating to trade. The technique which has been developed for dealing with problems involving statistical data has been applied to economics only to a small extent. The mastery of this technique, just as the mastery of the technique of practical physics or practical chemistry, requires systematic laboratory training. It is disappointing that so few economists have equipped themselves with this technique (which quite apart from the possible results it may discover is valuable for the development of ideas), so that their contributions to the solutions of important problems are often expressed as matters of opinion, each opinion being backed up generally by copious references to the writings of other economists.

Problems whose statistical basis is similar to that found in many economic problems often arise in connection with public health, in which field the statistical technique has been used to a much greater extent. There is an analogy, for example, between the problem of ascertaining if there is evidence of any economic factor affecting the change in death-rates in many districts over a series of years, and the problem of ascertaining if there is evidence of any economic factor affecting the change in the prices of many commodities over a series of years. So long as economists ignore statistical technique (or claim, without the practical training which can justify the claim, that the technique is not applicable to their problems), economic science will never obtain the respect which it should have. A good illustration of these remarks is afforded by the discussions of the past few months regarding the extent to which general monetary factors have been the cause of the heavy fall in commodity prices and of the trade depression. Recently, in a commercial paper, two economists gave their "opinions" in parallel columns on this problem. One article had a few figures in it but without a detailed analysis, and the other had practically no figures whatever. The opinion of the one economist was, "A closer examination of the violent fall in prices during the past year leads inevitably to the conclusion that the cause must be sought in an insufficient supply of means of payment." The opinion of the other was, "I attribute much of the severity and disorganisation of the slump to the breakdown of the various restrictive pools and monopolies which were so fashionable during the period of prosperity," and the whole tenor of the article was that monetary causes had very little to do with the slump in prices. It is a serious reflection on economic science that its professional exponents have not been able to reach approximate agreement on such an important subject. If they had shown that they were equipped with all the latest tools and had analysed all available data, and were still in disagreement, we should become more reconciled to the insolubility of the problem. So long as economics remains a matter of one man's opinion against another's, the one with the most attractive style gaining most adherents to his opinions, it is hardly likely to establish its authority in guiding public judgment.\*

\* In a paper published in the *Journal* in July 1926 it was shown that the data for the previous four years indicated that there was some evidence of a common factor or factors operating on price movements, though not, in that period, to a very large extent. "We conclude that the facts of the last four years are not inconsistent with the theory that the monetary lubricant does influence changes in the state of industrial activity, though the influence does not appear to be very substantial." The same methods applied to the data of 1927-30 would probably give higher correlations than were found for the earlier period.

I wish to express my appreciation and gratitude to Mr. G. R. White for substantial help in preparing this paper.

#### APPENDIX.

##### *The Determination of the "National Net Output" involved in the Exports from the United Kingdom.*

The total value of the exports of all goods from the United Kingdom in 1924 was £801 million f.o.b. This figure may be regarded as made up of three separate items: (a) the value of the raw or semi-manufactured materials used in the manufacture of the goods plus the fuel, power, etc. involved in the process of manufacture; (b) the "net output" of the section of industry devoted to export trade, including not only the "net output" of the industry making up the exported article in its final form but also the "net output" of all prior industries which performed work of some kind or other on the raw or semi-manufactured material, and (c) the cost of transferring the goods from the factory or place of production and placing them f.o.b. It is first necessary to reduce the figure of £801 million f.o.b. to the corresponding value at the place of production. Mr. Flux has estimated the charges on goods between the factory where they are produced and their stowage on board when exported at from 10 per cent. to 15 per cent. of the factory value. For the purpose of the present calculation I have taken these charges to be 12½ per cent. of the f.o.b. value, this percentage covering transport and merchandising charges and commissions. On this basis the "at factory" value of the £801 million is £703 million (no deduction is made in the item for parcel post). Turning now to the calculation of net output it is convenient to consider first the case of manufactured goods (Class 3). The export list of Class 3 consists of twenty groups—A to T—each group except the last including the production of a more or less homogeneous collection of industries. I have taken each group in turn and associated it with the various industries dealt with by the Census of Production. So far, except in the case of the textile trades, only preliminary reports have been published, but these contain data which allow the estimates to be made. The Census of Production gives for each industry the gross and net output, and the proportion of the latter to the former is applied to the "at factory" value of the corresponding exports, to ascertain the net value contained in the exports so far as this is due to the industry doing the final process. The determination of the figure to be taken for the ratio of net output appropriate to a particular class of exports involves in some cases a certain amount of difficulty. In the case of the boot industry,



where there is an export heading corresponding exactly with the Census of Production heading, the ratio of the net output to the gross output was 45 per cent., and applying this figure to the "at factory" value of the exports, namely £4.4 million, we get £2.0 million as the net output in producing this particular value of exports so far as it is due to the boot industry. In the case of the cotton industry, however, the ratio of net output to gross output calculated in the same way as the boot figure gives a false impression of the position. There is a great deal of duplication (in the Census of Production sense) in the cotton industry, many individuals within the industry receiving material from other individuals in the same industry. This does not occur to anything like the same extent in the boot industry nor in many other industries. The gross value of the products of the whole of the cotton industry, as given in the final report, was £367.5 million. In addition, work done on cotton and cotton goods by the textile finishing trades amounted to £31.1 million, while work done by the packing trade was approximately £2 million. The gross output of the cotton trades, including dyeing, finishing and packing, would, therefore, appear to be £400.6 million, but this includes substantial duplication owing to the fact that the output of the spinning section of the trade (with the exception of the cotton yarn exported) is the raw material of the weaving section, and the gross output of the weavers includes the value of the cotton yarn, which has also been included in the gross output of the spinners. The final report on the cotton trade estimates that, allowing for such duplications, the total value of the finished products of the cotton trade is £255 million. The net output of the cotton spinning and weaving trades was £83.7 million, and to this must be added the net output of the finishing and packing trades in so far as it refers to work done on cotton or cotton goods. These additions bring the net output up to £105 million. To obtain the final figures for the Export Group I, additions must be made for the output of the lace industry. The report on the latter covers lace from other materials than cotton, but as cotton net and lace are responsible for the greater portion of the figure of gross output, and as it is impossible to separate the gross and net output figures for lace manufactured from other materials, no serious error is introduced by taking the total output of the lace industry into Group I. The final figures thus obtained are £262 million for the gross and £108 million for the net output. The proportion of net to gross output in the cotton and cotton goods industry is thus 41 per cent. Similar duplication also occurs in the woollen and worsted industry, Group J. A calculation on similar lines to that for the cotton industry leads to a figure of 39 per cent. for the proportion of net to gross output.

To illustrate the first, and main, step in estimating the "net output" contained in the export trade I will take Group M of the export list, referring to clothing. This consists of the following sections, which are separately dealt with in the Census of Production volumes :—

Boot and Shoe industry, dealt with in Preliminary Report	2.
Hosiery	" " 9.
Glove	" " 9.
Hats, etc.	" " 17.
Clothing industry	" " 29.
Northern Ireland Clothing industry, dealt with in Preliminary Report	1.

The gross output and the net output for each of these industries as shown by the various reports were as follows :—

Industry.				Gross Output.	Net Output.	Proportion of Net Output to Gross.
				£ (1000)	£ (1000)	
Boot and Shoe	...	...	...	55,384	25,035	45
Hosiery	...	...	...	42,473	15,233	36
Glove...	...	...	...	2,259	1,023	45
Hats ...	...	...	...	13,509	5,224	39
Clothing	...	...	...	122,693	52,135	42
Northern Ireland Clothing...	...	...	...	3,340	1,440	43
Total	...	...	...	239,667	100,090	42

The range of variation in the proportion for the different industries comprised in this group is not large, and this is a fairly general conclusion for other groups. The figure of 42 per cent. is taken as representing the net output for the industries in Group M as a whole. Similar indices for net output compared with gross are worked out for all the other groups in Class III of the export list.

Obviously this is not a perfect method of procedure. A better method would be to take each individual industry as set out in the report of the Census of Production and use the proportion of net to gross output applicable to this industry alone, to determine the net output due to that industry in the corresponding exports. To illustrate this we should take, say, the boot and shoe net output proportion (45 per cent.) and apply it separately to the gross value of the boot and shoe exports; then the hosiery net output proportion (36 per cent.) and apply it to the gross value of the hosiery exports, and so on. This involves much more work, and it seems sufficient in view of the limitations of the data to be content to take the twenty main groups of industrial output and not go to the detail involved in taking every possible case.

The application of this procedure to the determination of the "net output" in the manufactured articles exported in 1924, so far as this output is due to the industry doing the last process, gives the following results:—

*Class III. Articles Wholly or Mainly Manufactured, 1924.*

Group.	Total Prodn. in U.K.	Net Output in Total Prodn.	% added by Manu- facture.	Gross value of Exports.	Value of Exports "at factory."	"Net Out- put" in Exports (b)
	£ (000)	£ (000)	%	£ (000)	£ (000)	£ (000)
A	90,387	34,873	39	6,231	5,452	2,126
B	74,699	47,029	63	12,864	11,256	7,091
C	257,943	77,319	30	74,190	64,916	19,475
D	63,005	17,304	28	15,658	13,701	3,836
E	51,493	27,423	53	8,835	7,731	4,098
F	69,938	33,393	48	10,681	9,346	4,486
G	150,880	84,578	51	44,783	39,185	19,984
H	60,793	28,959	48	2,289	2,003	962
I	262,000 (a)	108,000	41	199,162	174,267	71,449
J	148,000 (a)	58,000	39	67,797	59,322	23,136
K	5,400 (a)	3,600	67	2,187	1,914	1,282
L	103,000 (a)	46,000	45	27,532	24,091	10,841
M	239,667	100,090	42	30,047	26,291	11,043
N	80,862	35,368	44	25,478	22,293	9,809
O	38,079	17,580	30	8,921	7,806	2,342
P	44,479	12,646	29	7,107	6,219	1,803
Q	52,188	21,164	40	9,230	8,076	3,230
R	206,254	95,241	46	26,925	23,559	10,838
S	25,235	12,356	49	6,077	5,317	2,606
T	138,910	77,966	56	32,862	28,754	16,103
	2,183,212	938,889		618,856	541,499	226,540

(a) The gross figures for the textile trades are taken from the final report of the Census of Production and are free of duplication.

(b) As is clear from the text, the figures in this column do not give the complete net output, but merely the net output due to the industry doing the last process.

The allocation of a particular industry to the corresponding export group is generally straightforward, but not always so, and in a few cases some adjustments are necessary. For example, the export Group G is "Machinery." Group F, "Electrical Goods and Apparatus," however, includes some electrical machinery, while Group R, "Vehicles (including Locomotives, Ships and Aircraft)," contains marine machinery. Preliminary Report No. 16 of the Census of Production relates to "Engineering Trades," but it states separately the output of marine machinery and electrical machinery. It is possible, therefore, to allocate the output of the machinery industry to the three export groups F, G, and R. In one case an industry dealt with in the Census of Production Preliminary Report No. 5—Seed Crushing—does not correspond to a single group in the export

list of manufactured goods, but to two groups under the headings "Raw Materials and Articles mainly Unmanufactured" (II, J) and "Food, Drink and Tobacco" (I, E). The totals of the various columns in the table above are :—

Gross value of Total Production of Manufactured			
Articles included under Export heading III	...	£2,183 million.	
Net Output contained in Total Production	...	£939	„
Gross Value of the Exports of Manufactured Articles	...	£619	„
Value of Exports "at factory"	...	£541	„
* "Net Output" contained in Exports due to industry			
doing last process	...	£227	„

We have next to deal with the commodities falling under Class II in the Trade Returns—"Raw Materials and Articles mainly Unmanufactured." The procedure in this case is more complicated than in Class III. Some of the groups of articles, *e.g.* Group A, "Coal," give no difficulty, as we can associate the export directly with the corresponding production. In other cases, however, *e.g.* F, "Cotton Waste," the articles exported are really the products of one or other of the Manufacturing Groups in III. In such cases the percentage to apply to get the "net" figure contained in the exports is the one provided by the Manufacturing Group. The £1,855,000 of exports under heading II, F—"Raw Cotton and Cotton Waste"—is a product of the cotton industry, and for the present purpose should be related to III, I. Other groups in Class II give more difficulty. Group C, "Iron Ore and Scrap," is a composite group, consisting in part of the raw material, the product of the industry "Metalliferous Mines" (Census of Production Preliminary Report, 26), and in part of a by-product of the iron and steel industry. The export, however, is small, and has been associated entirely with the former. The Group II, G, "Wool, Raw and Waste, and Woollen Rags," is with the exception of Coal the largest of all in Class II, the exports under this head in 1924 being £12,437,000. It is impossible to analyse this item satisfactorily, as it includes imported wool scoured in this country, as well as native wool—greasy or scoured—the waste in combing and spinning wool, as well as rags from worn-out clothing. The proportion of raw native wool is probably small, and it seems best to relate the exports to Group III, J, remembering too that the production corresponding to the export of the raw wool is included under the Agricultural Output. In the case of hides and skins I have made separate calculations of the production. These are mainly by-products of the meat industry, and the extent to which this industry is under-estimated in the general calculation of national

\* Using the term "Net Output" in the sense defined earlier in the Appendix.

output is referred to elsewhere. A summary showing the treatment of Export Groups falling under Class II is as follows:—

*Class II. Raw Materials and Articles mainly Unmanufactured, 1924.*

Group.	Total Prodn.	Net Output in Total Prodn.	% added by Manufacture.	Gross Value of Exports.	Value of Exports "at factory."	"Net Output" in Exports (a).
	£ (000)	£ (000)	%	£ (000)	£ (000)	£ (000)
A	250,306	209,826	84	72,080	63,070	52,979
B	14,867	11,925	80	2,114	1,850	1,480
C & D	4,477	3,265	73	1,796	1,572	1,148
E	2,100	1,900	90	642	562	506
F	Related to Class III, Group I			(1,853)	(1,623)	(584)
G	Related to Class III, Group J			(12,437)	(10,882)	(3,918)
H	Related to Class III, Group K			(128)	(112)	(50)
I	750	680	90	404	354	319
J	36,344	3,832	11	6,917	6,052	666
K	7,000	6,300	90	976	854	769
	2,000	700	35	1,525	1,334	467
L	Related to Class III, Group Q			(1,878)	(1,643)	657
M	Related to Class III, Group S			(118)	(103)	(50)
N	Prodn. in Agricult. Output			(1,150)	(1,006)	(905)
	" " III, A			(1,397)	(1,222)	(476)
	" included elsewhere			(1,065)	(932)	(700)
				106,482	93,171	65,674

Group C & D. "Scrap" portion of output included in III, C and D.

Group E. Production given by Census of Board of Agriculture.

Group F. Production included in Class III, Group I.

Group G. Some production included in Class III, Group J, remainder in Agricultural Output.

Group H. Production included in Class III, Group K.

Group I. Assumed to be practically all flax from Northern Ireland.

Group J. Some of the output of the seed-crushing industry is food, the exports of which are included in I, E; as the output figures cannot be separated they are included here. In group I, E, we have some exports for which the corresponding output is included here.

Group K. Production of cattle hides and sheepskins estimated from non-official data. Allowance made in total agricultural output. Exports of other classes of skins assumed to be mainly from imported material.

Group L. These materials probably mainly by-products of industries in Class III.

Group M. These materials by-products of Group III, S.

Group N. The miscellaneous group II, N consists of (a) seeds for which production figures are included in Agricultural Output, (b) Tar and Pitch, the production figures for which are included in III, A, and (c) other articles for which it is assumed that the corresponding production figures are included elsewhere.

(a) The figures in this column refer only to the net output due to the industry during the last process.

The totals from the above table which are to be taken into account and added to those previously attained for Class III industries are as follows:—

Total Production ... ..	£318 million.
Corresponding Net Output ... ..	£238 „
Gross Value of Exports ... ..	£86,454,000 plus (£20,028,000) = £106 million.
Value of Exports "at factory" ... ..	£75,648,000 plus (£17,523,000) = £93 million.
"Net Output" in Exports due to industry doing last process ... ..	£58,991,000 plus (£6,683,000) = £66 million.

In a few cases in the above table estimates have to be made which are little more than guesses. These guesses, however, always relate to relatively small items, and a substantial error in the guess is not likely to cause any significant difference in the final result. These guesses are necessary, for the most part, because of our lack of information about the by-products of industry. These by-products of industry in the aggregate are much more important than is generally appreciated, and it is unfortunate that the particulars collected in the Census of Production by the Board of Trade and of the Agricultural Output by the Board of Agriculture do not enable us to get a comprehensive view of this important aspect of industry.

The next stage in our progress is to deal with the commodities falling under Class I, "Food, Drink and Tobacco." The output falling under this heading is the whole of the output provided by the Census of Output of Agricultural Produce of England and Wales, Scotland and Northern Ireland (with certain adjustments referred to above in dealing with Class II), plus the output of Fisheries, plus the output of certain of the industries dealt with by the Census of Production.

The gross value of the agricultural output in 1925 was as follows :—

England and Wales ... ..	£225 million.
Scotland ... ..	£49 „
Northern Ireland ... ..	£15 „
Total ... ..	£289 million.

These figures, however, include the value of store cattle imported, feeding stuffs, fertilisers, etc., either imported or the product of some British industry. These items are in the nature of the "materials used" in the Census of Production and should be subtracted to give the net output of agriculture. On a generous estimate it would appear that the total of these did not exceed £25 million and was probably less, and we are probably under-estimating in taking the net output of agriculture in Great Britain and Northern Ireland at £262 million. Adding £18 million for Fisheries, the total net output of the national activities covered by the Census of Output of the

Ministry of Agriculture of the different sections of the country comes to £280 million.

The articles exported under Class I are (1) the agricultural output referred to above, and (2) the "food" industries dealt with by the Census of Production. There is considerable difference between the ratio of net to gross output for (1) and (2) respectively, *e.g.* the ratio for the products of grain-milling is only 11·6 per cent. and for cocoa and confectionery is 42·6 per cent., compared with a figure of about 90 per cent. for the direct products of agriculture. A perusal of the list of commodities in Class I which are exported, however, shows that they fall almost entirely under heading (2). The group E and F, which constituted 75 per cent. of the whole of the Food and Drink in Class I, consisted of 97 per cent. of products falling under heading (2). We shall not be far wrong, therefore, in calculating the net output of the various groups composing Class I from the data provided by the Census of Production for the appropriate industries, and in taking the whole of the direct agricultural output as being consumed in this country. The estimation of the net output contained in the exports falling in Class I is accordingly as follows :—

*Class I. Food, Drink and Tobacco, 1924.*

Group.	Total Prodn.	Net Output in Total Pro in.	% added by Manu- facture.	Gross Value of Exports.	Value of Exports "at factory."	"Net Out- put" in Exports (a).
	£ (000)	£ (000)	%	£ (000)	£ (000)	£ (000)
A	101,479	11,763	12	7,439	6,509	781
B	6,693	2,088	31	3,079	2,694	835
C	40,546	16,045	40	1,630	1,426	570
E & F	421,560	214,091	51	38,005	33,254	16,960
G	93,241	23,942	26	6,544	5,726	1,489
	663,519	267,929		56,697	49,609	20,635

Group A. Industry included is Grain-milling (Report No. 3).

Group B. Industry included is Cattle Food (Report No. 17).

Group C. Industries included are Bacon-curing (Report No. 14) and Preserved Meat (Report No. 17).

Group E and F. Industries included are Sugar and Glucose (Report No. 3); Spirit and Distilling (Report No. 3); Spirit Compounding (Report No. 3); Brewing and Malting (Report No. 13); Aerated Waters (Report No. 13); Butter and Cheese (Report No. 19); Fish-curing (Report No. 23); Bread and Biscuit (Report No. 25); Salt Mines (Report No. 26); Cocoa and Confectionery (Report No. 27).

Group G. Industry included is Tobacco (Report No. 3).

(a) The figures in this column refer only to the industry doing the last process.

To the production figures in the above table have to be added those for the Food Industries of Northern Ireland (£15,117,000 gross and £2,969,000 net), while to the exports have to be added the small

item of Group D, "Animals, living, for Food," amounting to £260,000 gross or £227,000 at the farm and taken at £205,000 net. Allowing for these the totals falling under Class I are :—

Total Production ... ..	£679 million.
Net Output in Production ... ..	£271 ..
Gross Exports ... ..	£57 ..
Value of Exports "at factory" (or farm) ... ..	£50 ..
"Net Output" in Exports due to industry doing last process	£21 ..

There are two other classes of exports to deal with in order to cover the whole export field completely. One is Class IV, "Animals not for Food," the gross value of the exports being £2,299,000, or £2,012,000 at the farm, and the net is taken at £1,810,000. The other is Class V, "Parcel Post," the gross value being £16,373,000, and the net is taken at £8,200,000. No deduction is made in this item for transport, etc.

Summarizing the figures above, we reach the following statement :—

Class.	Production.		Exports.		
	Gross Output.	Net Output.	Gross.	Value at factory.	Net Output due to last process.
I	£ (million). 679	£ (million). 271	£ (million). 57	£ (million). 50	£ (million). 21
II	318	238	106	93	66
III	2,183	939	619	541	227
IV & V	—	—	19	19	10
Total	3,180	1,448	801	703	324

Nearly all the difference between the £801 million and the £703 million is in the nature of net output, so that something not far short of £98 million must be added to the £324 million to get f.o.b. figures comparable with the £801 million. The gross output of the industries associated with export trade totals £3,180 million with net output £1,448 million. The gross output of agriculture and fisheries was £307 million and net value £280 million. The industries not directly associated with export had gross output of £560 million and net output £302 million. The grand total gross output was £4,047 million and net £2,030 million.

This figure of £4,047 million contains duplication of two kinds. In the first place, for industries other than textiles, in respect of which allowance has already been made, there is duplication within the industry which arises when two different firms do work on the same article, and secondly there is duplication due to prior industries, e.g. the gross output of the boot and shoe industry includes the value of



the leather used in the manufacture of the boots and shoes, and this has already been included in the gross output of the leather industry. The extent of the duplication due to the former cause is probably small (except in the case of textiles already allowed for), but duplication due to prior industries is very considerable. Mr. Flux estimated that the gross output of industry and agriculture free of duplication was £2,655 million. These figures of £4,047 million and £2,655 million relate not merely to the export industries but to the non-export industries and agriculture. If it had been possible in the calculations made above for each group to have used for the "gross output" in each case figures free from duplication both as regards the final and the prior industries, the "proportion of net output to gross" would, in general, have been higher than was stated. Allowance was specifically made for duplication of both kinds in the case of textiles, and in at least one other large export class, namely coal, there can be practically no duplication. The whole of the duplication in the gross output figure reached above of £4,047 million, therefore, may be attributed to industry and agriculture other than textiles and coal. The result of removing textiles and coal from the total figures of output may be set out as follows:—

	Gross output (from above tables).	Gross output free of duplication.
	£ (million).	£ (million).
Of industry and agriculture ... ..	4,047	2,655
Of textiles trades ... ..	518	518
Of coal industry ... ..	250	250
Of industry and agriculture less textiles and coal ... ..	3,279	1,877

Thus, if for the items other than textiles and coal the extent of duplication in the export industries is the same as in industry as a whole, the percentage used for determining the net output (in so far as it was due to the final industry) in each class of the exports, other than textiles and coal, would have to be increased by 74 per cent. in order to cover duplication due to prior industries. The proportion of the total net output figure of £324 million accounted for by textiles and coal is £160 million. If the remaining £164 million is increased by 74 per cent. we get a figure of £285 million, which with the net output for textiles and coal gives a final figure of £445 million. This is at the factory, and the figure must be increased by rather less than £98 million to give the corresponding amount for f.o.b., leading to £540 million f.o.b.

There remains one further addition to be made. The "net output" figures for the exports so far reached do not include any-

thing for the "net output" of the industries supplying the "non-ingredient" materials to the exports. In the cases of the boot and leather industries the "ingredient" materials form more than 95 per cent. of the total materials. In Appendix I—Tables of Costs of Production—in Part II of the Report of the Balfour Committee on Industry and Trade, certain information on the same point is furnished for other industries. In a number of cases the percentage appears to be over 95, but in some it is much less, *e.g.* the chemical industry. There seems to be little justification from the data I have examined in taking the average of all at less than 95 per cent. If we take 5 per cent. as the proportion of "all materials" to be added under this heading we get a figure of about £10 million.

The grand total of the various contributions to the "national net output" involved in the export trades on the basis of the figures above is, therefore, about £550 million.

#### DISCUSSION ON DR. SNOW'S PAPER.

MR. A. W. FLUX: You have heard the remarkably interesting paper that Dr. Snow has summarized for us, and I have not the least doubt that you will agree with me that it is full of matters that some of us will be wanting to discuss at some length. I do not propose, therefore, to take up much time in performing the very pleasant task of moving that our best thanks be given to Dr. Snow for preparing and putting before us this paper on "The Relative Importance of Export Trade." It is an especial pleasure to find someone who believes that it is worth while hunting among the Reports of the Census of Production to get some light on current problems. I believe I am right in saying that the Census of Production was created for the purpose of providing data to enable some of the most important problems confronting the public to be discussed more intelligently and with a better chance of reaching sound conclusions than was possible in the absence of the data that the Census was designed to obtain. Having had my time considerably taken up in connection with the work of the Census, it has rather struck me how little use seems to have been made of the data that were gathered with that purpose in view, and I therefore particularly welcome a plunge into this mass of data with a view to obtaining information on leading principles. I feel, however, in view of the small amount of time I propose to allow myself, that I must just indicate one or two points where, if I were setting out the data that Dr. Snow has carried us over, I should set about it somewhat differently from the way he has chosen.

In the Reports of the Census of Production there are provided estimates—sometimes reasonably close, sometimes not—of the total value of the goods made by an industry as a whole when we have got rid of duplication and are considering the industry as if it were

one great workshop, the value being considered when goods came out from that workshop. An attempt has been made in the reports of the Census of Production to give these values, the use of which would have given Dr. Snow's final figures quickly, definitely and clearly. (I refer here to figures on p. 377.)\* It was not clear to me without a considerable amount of examination of the data, whether Dr. Snow had brought into his account the work of the trades engaged in finishing textile products, such as cotton goods, which is necessary in view of the fact that a very large part of our exports are of piece goods bleached, printed, dyed, or woven of dyed yarn. There are other trades which present the same problem besides cotton spinning and weaving. However, a short piece of arithmetic in connection with the figures in the published reports enabled me to agree with the final figure reached by Dr. Snow.

There was another point where I did not get so close to Dr. Snow's results. Dr. Snow set out to calculate a total net output covering not merely the manufacturing trades, but also all other trades. In doing that he has reached a total estimate for wages and salaries in the country (p. 385) of £2,589 million, meaning roughly £2,260 million for wages. I seem to have heard of estimates of the total wages of the country that do not agree with that figure by a good deal; the figure which I think should be here is nearly 30 per cent. lower. I am bound to give a reason for suggesting that difference. In the newspaper industry, I said on a previous occasion in this room that there are covered by the net output of the industry (as shown in the reports of the Census of Production) the payments for the services of News Agencies, the numbers of whose employees are not included in the numbers of persons employed by the newspaper owners who are printing and publishing the papers. The same kind of thing in smaller degrees is found in most other industries, and a good deal of the proposed addition is already covered in that net output to which Dr. Snow adds his £1,500 million. The importance of the principle on which he is engaged remains, even if this numerical correction is made, but it will involve a correction in the percentage at which he arrives. If the total of wages is to be £1,600 million and we take his 10 per cent. to add to it, and get £1,760 million for wages and salaries, the proportion is a good deal higher than 1 in 8. The 10 per cent. to be added is possibly an under-estimate, because the number that has to be added to the wage-earners as shown in the Census of Production Reports is 10 per cent., and the average of salaries is probably higher than for wages.

These are two points in which I should propose to introduce some changes in the actual arithmetical results that Dr. Snow has put before us, but it does not in any way affect the pleasure with which I welcome the placing of a paper on this subject before this Society—a pleasure which will be shared by all who have had the privilege of listening to this paper. Although in the time at my disposal I have had to voice some disagreement with Dr. Snow's paper, this does not affect the confidence with which I move this vote of thanks, which I shall ask Mr. Lloyd to second.

\* Now amended in accordance with these remarks.—E. C. S.

MR. G. I. H. LLOYD : I rise with peculiar pleasure to second this vote of thanks for the paper Dr. Snow has presented to us. Perhaps I may direct the discussion into somewhat more general channels than the Chairman has done. This is a learned Society, but it often deals with questions of vital national moment, and I think no question affecting export trade can at the present time be regarded as other than one of fundamental interest. I need only say in passing that anyone who has studied the figures in the current number of the *Board of Trade Journal* giving the trade results for the last quarter cannot but feel the gravity of the present position.

While expressing the gratitude I feel to Dr. Snow, I must qualify that a little on looking at his paper, because I think he has shown some excess of liberality in the range of topics he has allowed himself to cover. I wish he had been a little more economical, in which case I think the Society would have benefited, because it might have got two, three, or four papers instead of one.

I must also confess that while I have read many papers presented to this Society, I have rarely found one that was more elusive and difficult to summarize; this is perhaps due to the way in which Dr. Snow turns from one subject to another. The paper has also some features of a more controversial and provocative character to which I will not refer, except perhaps to suggest that when he whips the economist for lack of statistical capacity, he should remember that he lays himself open to the retort that a statistician dealing with these questions must understand economic analysis.

The value of export trade is a question of very great gravity; it is one which Dr. Snow speaks of in what I can only call a light-hearted pessimism, when he says, "Even so, however, it is worth debating whether the importance of export trade has not been exaggerated with us. Is national prosperity certainly dependent upon constantly striving to do as much export business as possible and depressing our standard of life to do so?" I am not quite sure as to what is meant by "depressing our standard of life" in order to secure "prosperity," but I think it is a formula similar to that underlying the Five-Year Plan in Russia.

If I were asked what is the most significant point made by Dr. Snow from this general standpoint, I think I should take his answer about what I might perhaps call the "net exports" rather than the "net output"—that is, the value of exports omitting the imported material. In his first analysis he gives these materials as £225 million out of £801 million. That leaves a balance of £575 million for net exports, but later on he lowers this £575 million to £560 million in order to adjust it to his second calculation. I am not sure that I have followed him, however, because later on (p. 397) I read that it was "estimated earlier in the paper that the value of imported raw material contained in the £801 million of exports is £240 million." I make it 225 million and, subject to correction, I will comment on that figure. Now £225 million is, of course, 28 per cent. of the export trade total. If now I turn to Mr. Flux's Presidential Address on "National Income," which supplies one of the main foundations for Dr. Snow's paper, I

find his estimate of £640 million representing imported goods on which some industrial operations were subsequently undertaken. Making an addition to cover transit charges from port to factory, I get £720 + 16 million, and relating that to the estimated total industrial and agricultural output of the United Kingdom in 1924, which Mr. Flux puts at £2,655 + 20 million, I get 27 per cent. as the proportion of imported material in the aggregate output of the country. That 27 per cent. seems to me, therefore, to compare with Dr. Snow's 28 per cent. I do not think Dr. Snow's method is of such accuracy that he would say that 1 per cent. is a significant difference, and thus I do not think we have got much new information beyond a suggestion that exports are a fair sample of the total industry. This seems to me not surprising and not unreasonable.

Mr. Flux's reference to the figures I have quoted was prefaced by a proposition I have always found a little startling: "the materials of industry consist mainly of imported goods." Obviously that does not apply to the aggregate materials of all industries, for most of them are analysed into net output of earlier industrial operations. Consequently the statement becomes more of a truism and less of a paradox.

I should like to return to Dr. Snow's figure for net exports of £575 million. That seems to me to be the figure which stands for the national purchasing power in relation to imports which is created by export trade. It is not the whole of the credit value of our export trade, because, of course, there are additional national charges for transport, marketing and so forth to be added to the credit side, just as there are charges which might be subtracted from the import value, so far as the import values represent earnings by national transport, banking and other operations. While, therefore, it is convenient to reckon these invisible exports separately, it should be remembered that they are closely dependent on the maintenance of export trade.

Let us take the total of retained imports and subtract the value of materials subsequently exported in order to get the net figure. Here I am not quite clear whether the £225 million (if that is the right figure) is the value at port of exportation or for import, but I think I am right in saying that that represents the import value of the imported material in exports, and if so, I must take that from the total retained imports. If I also subtract the value of finished manufactures imported, that is £118 million representing articles ready for consumption, and £91 million of articles manufactured but requiring adaptation or combination (both of which Dr. Snow thinks should be made at home), I shall get a figure of £703 million, representing substantially the imports required for national use and consumption. Putting that against Dr. Snow's estimate of net exports of £575 million, we have a ratio of 82 per cent. of essential imports paid for by exports. I suggest this as the starting-point for an answer to the question as to the relative value of export trade.

Dr. Snow says this is all very well as history, but it won't do to rely too much on export trade in the future, lest the scramble for

trade should drive down the standard of living; he is inclined even to be complacent about dwindling exports because he hopes that the other factors of international purchasing power will be maintained. I want to suggest that we cannot work on that basis. It is impossible to suppose that export trade is going to dwindle and at the same time that our overseas investments will necessarily be maintained, and that our other credits, such as shipping and banking transactions, will afford the necessary purchasing power for the food and materials in use. It will not do; I think we have to maintain our export trade, and that therefore the crucial question is whether we cannot possibly overcome the present crisis and go from strength to strength rather than from strength to weakness.

I have great pleasure in seconding the vote of thanks to Dr. Snow.

MR. L. C. HARRIS said that he was a very poor swimmer and apt to get out of his depth; after spending a week-end in reading the paper, he felt that he was out of his depth. He was not a statistician, and not a member of a learned Society; he simply represented the shipowners and was asked to come to the meeting and to say something. He would not attempt to criticize the paper, but proposed to make a few comments on points arising out of the paper from the shipowners' point of view.

He noticed with great interest that in stating the export values, Dr. Snow omitted freights and stopped when he got to f.o.b. If he did that because the outward freights were negligible in respect to the values, he was entirely correct, because there was no cheaper or more efficient method of transport than that of shipping overseas. There was no need for worry about the cost of the freight, because it would always be so small that it would make no difference to the business. If he omitted it, however, because it was a thing of no consequence, Mr. Harris would ask Dr. Isserlis to quote the figures of invisible exports to show how important to the country were shipping freights as represented in invisible exports.

Dr. Snow seemed to suggest that it might be possible that this country might give up export trade. It did not seem possible that she could then continue to import except in so far as her shipowners traded for other countries, bringing in invisible exports. That was all the shipping that would be left to them, and it seemed hard to imagine how this country with its population could exist without export trade.

In respect of freights, from a shipowner's point of view this was international: shipowners were national and international. If they could not get a freight from England, they would from the Continent or from America. It might be said that it did not matter to the shipowners where their freight came from, but although Mr. Harris did not believe in those national views in shipping which are being so ardently advocated to-day in certain countries, yet as English shipowners they were intensely interested in English export trade, because they were busily engaged in bringing freights to Great Britain, and if they had no freights outwards they would have to charge the whole cost of the outward to the homeward voyage. That

was what was happening now; they were having no freight out, or perhaps 1,000 tons per steamer, and were bringing back say 10,000 tons, which must pay for the outward voyage. No shipowners wished to ship to America in ballast before they could get another freight.

Mr. Harris said he was speaking to the title of the paper rather than to its contents, but from a shipowner's point of view it was most earnestly desired that the export trade be maintained through thick and thin. In that connection Dr. Snow had dealt with a most interesting subject to all shipowners—the question of coal. His own Company, with more than a hundred ships, had only one Diesel ship, and personally he would strongly back coal, because from the English point of view it must be backed if English trade were to continue to succeed. He did not wish to see coal converted into oil; he would like to see it used pulverized. If oil were exported it had to be conveyed in tankers, which went one way empty. If coal were exported, it would be possible to get a freight outward and home; therefore to make trading cheap for Great Britain it was necessary by hook or by crook to get back to the export of coal.

Another interesting point was that Dr. Snow put charges for the short distance from the factory to f.o.b. at an average of 10–15 per cent. of the value of the goods. Shipping was the cheapest method of transport; for an average of 5–7½ per cent. the goods could be carried to any port of the world.

With reference to the export cargoes of this country, everything exported excepting coal was worth on the average from £20–£30 per ton, and if that were the value, the goods would be carried for from 5–7½ per cent. of that value by sea, yet it cost more than double that amount to get the goods from the factory to the seaport. It might be possible to find means by which that 10–15 per cent. could be reduced; it touched the question of the national livelihood as to how it could be substantially reduced. Mr. Harris said he would not desire to talk about reducing labour wages, but until the costs of living were reduced, Britain could not maintain her prosperity. Dr. Snow had referred to the standard of living, but it was not the standard but the cost that they must aim at. If only the cost of living could be brought down there would be plenty of export and an increase in imports—the two reacted upon one another—and so prosperity might return.

PROFESSOR A. L. BOWLEY said that Dr. Snow, in his opening paragraph, referred to a rough estimate in the *Economist* which stated that "between 25 and 30 per cent. of the whole product of industry, mining and agriculture, is exported." This estimate depended on taking £530 million as the value of the net output for export at the time the goods left the factory. Dr. Snow found by one estimate £550 million f.o.b., and by another £575 million. This allowed 4 to 14 per cent. for transport from the place of production to the port, and consequently the earlier estimate was not inconsistent with his. After Dr. Snow had finished his analysis he arrived at the lower of the limits above named, or close to 24 per cent. He had ostensibly spent much

labour on the matter, and it was interesting to see the method he had applied to that point.

Professor Bowley wished to point out what appeared to be a slip on p. 380. If he added 15 per cent. of the gross for distribution charges, the comparison of the "net output" in exports to the total "net output" was the ratio of 575 to the result, or about 25 per cent., and not 24 per cent.

On p. 385 Dr. Snow proceeded to make an estimate of wages paid to the industries covered by the Census of Production. He might have referred to the estimate already made by Mr. F. Brown and published in *Economica*, 1929, using the partial Wage Census of 1924. Professor Bowley felt bound to follow the Chairman in challenging the estimate of wages on p. 385. It was difficult to come to close quarters with the estimate, because in this case there was considerable evidence of guess-work, and he had not been able to verify the figures through the various estimates. He thought it reasonable to say that there were materials for estimating wages in considerable detail from the Wage Accounts of 1924 and 1928, and Dr. Snow, by neglecting these particular estimates, had arrived at a figure which was quite contrary to expectation. However, in the general ignorance of the actual rate of salaries, it was very difficult to get statistics that would lead to a valid estimate of wages plus salaries.

Professor Bowley regretted that he had had to spend the short time allotted to him in the discussion in rather definite criticisms, but he thanked Dr. Snow for showing the elaboration of part of his work in his Appendix, while he wished that in the other cases he had been able to find space to give his data rather more clearly.

MR. R. GLENDAY wished to associate himself strongly with what he took to be the gist of the second part of Dr. Snow's paper, viz. his plea that economic theory should be brought more nearly into relationship with business experience, and his suggestion that certain of the matters with which he dealt should be subjected to statistical analysis of a new and more practical kind. He was afraid that his own disapproval of many of the formal propositions of orthodox economics went deeper than Dr. Snow's; in certain respects economic science was in much the same condition as biology in the middle of the last century, when the dead hand of abstract theory had inhibited practical experiment for nearly a generation. He hoped it would not be thought that in saying this he did not appreciate the valuable work done by economists, but he did feel that the reason why propositions such as "imports pay for exports," as well as many of those relating price movements to changes in money supply had proved so sterile, was that they were incapable of being translated into the dynamic terms of real life. Accordingly, the positions of equilibrium which they postulated never existed in real life—except possibly for an instant of time. Trade was concerned with periods of disequilibrium. Industrial progress consisted of *movement* from one position of equilibrium to another; the *stationary* point of equilibrium itself being regarded as a point of stagnation rather than as an objective.

To explain by an analogy what was in his mind, he might say that



economists appeared to envisage problems of prices and money as if trade were a sort of stationary pool to or from which things were added or subtracted. From the practical industrial point of view, however, trade was more like a river—a moving stream with a life history of growth and decay; its channel formed by the reactions of its own movements to the changing environment through which it passed. It was fed by tributaries of commodities each with its own separate life history of growth and maturity, and possibly ultimate extinction. The period from birth to maturity of any one commodity might be anything from a fraction of a year to a century, or more. The motor-car, for example, took from thirty to forty years to reach maturity; while the life cycle of midget golf appears to have been completed in little over a year.

Comparisons of the aggregate volume of commodities in such a river at arbitrarily selected moments of time—such as the yearly returns of the Board of Trade—were not very helpful in understanding what was happening: any more than the assertion of certain monetary experts that our present troubles are due to the fact that the level of the water in the stream had not been kept constant.

Relating this analogy to the subject-matter of the second half of Dr. Snow's paper, and considering the history of trade over the last century from the point of view of commodities, it might be described as having consisted of the dissemination to the world at large of a gradually increasing series of new commodities: each starting as a rare and expensive article and becoming in the process of time and the application of human ingenuity a reasonably priced staple of general consumption. At any moment of time the stream could be regarded as including three broad categories of commodities:—

*Old staples* (i.e. obsolescent commodities in process of being displaced by new).

*Current staples* (i.e. commodities enjoying the relative stability of maturity).

*Future staples* (i.e. commodities which were going to form the staples of the future, that is to say, which were either in the process of birth or had just started on the road to maturity).

Dr. Snow's suggestion that the relative wages level must be the ultimate determining factor in competition appeared to relate to the goods in the first two of the three categories only. So far as "Future staples" were concerned, novelty, exclusive design, monopoly of invention, etc. were more important than price. But this was not the whole matter. Great Britain built up her prosperity not only by being first in the field in producing new commodities, but also—what was almost more important—by being first in preparing new markets for "current staples." The goods exported for this preparation also had not been supplied solely on a competitive price basis, but with the assistance of the process called "foreign investment." Reduced to its basic elements this type of foreign investment might be described as in part consisting of lending "current staples" of one country to inhabitants of another in the hope that at some future date those inhabitants might be enabled thereby to send in

exchange either some new commodity (*i.e.* a future staple) or to open up a new supply of an existing staple of which there was a relative scarcity.

Shortness of time prevented him from elaborating the argument. He would therefore confine himself to observing that, in the years immediately preceding the war, our overseas loans were equivalent in value to between 30 per cent. and 50 per cent. of our commodity exports, while the interest on previous investments was equivalent to something like 25 per cent. to 30 per cent. of our imports.

MR. NORMAN CRUMP said that Dr. Snow had tackled a very important and somewhat controversial subject, and if in the following remarks he passed direct to one or two points he wished to raise, it was out of consideration of the short time at his disposal, and did not imply that he did not realize the amount of work put into the paper.

The first point to which he wished to refer was one of technique. Mr. Flux and Sir Josiah Stamp, in their Presidential Addresses on the National Income and the National Capital, in making their estimates inserted the whole way through a margin of error, plus and minus. He could not help feeling that it would have been better if Dr. Snow through the whole of his work leading up to his numerical results had also inserted a margin of plus and minus, because it was an elementary fact that if margins of this kind were introduced throughout, the resulting answer showed a wide and cumulative margin of difference. Mr. Crump's reason for making this point was that on p. 386 Dr. Snow came to the conclusion that from the point of view of wages and salaries export trade had an importance of only 1 in 8. This figure had already been subjected to both general and mathematical criticism by previous speakers, which made it all the more essential to attach to it a suitable margin of error. This was especially necessary because there was great danger that that figure might go out into the country and be quoted by people who did not realize the statistical limitation of that figure as clearly as did the Fellows of the Society present that evening.

The second point arose out of the title of the paper: The Relative Importance of Export Trade. This title suggested several further lines of investigation which very well might be undertaken by Fellows of the Society and presented at some future date. For example, if it was wanted to answer the question, What is the Relative Importance of our Export Trade? the points that would suggest themselves would be, How many workers, how much capital, how much plant and machinery are engaged in export as opposed to home trade? How far are certain workers, factories, mines, etc., irretrievably committed to export trade, or how far could they switch over to supplying the home demand? What towns or localities, such as the South Wales coal-field or the Lancashire cotton industry, are dependent upon export trade, and what is their relative importance to the country as a whole?

Mr. Crump said he did not propose to pursue this line of thought any further, because obviously an investigation of this kind would be a very long and complicated one, and much of the relevant data was

lacking, but he did urge that unless and until the question was investigated upon these lines, it was rash to try to determine the relative importance of our export trade, and give it to the country in the form of a final and definite figure.

He was not quite clear why Dr. Snow thought fit to introduce an *obiter dictum* to the effect that imports did not pay for exports, especially as he did not substantiate it by any rigid mathematical proof. The balance of payments equation on p. 397 was, of course, of great interest and importance, so much so that it could well form the subject of a separate paper. Unless and until some Fellow of the Society rendered this inestimable service to the nation, he thought it best to reserve judgment on the somewhat controversial thoughts inspired by this section of Dr. Snow's paper.

Thus, in common with other speakers, his verdict on Dr. Snow's indictment of the value of our export trade was one of non proven. His results ought not to escape challenge and could not be regarded as precise. Still, this did not detract from the stimulating value of his paper, and he had great pleasure in supporting the vote of thanks.

DR. ISSERLIS said that in view of the lateness of the hour he wished to confine himself to one point only; he wanted to ask Dr. Snow, who had given this interesting paper on "The Relative Importance of Export Trade," to give one further gloss on the word "importance." There was a simple and practical problem, but not necessarily a soluble problem. Here was a population of say 40 or 45 millions.  $x$  of the population were engaged in the home trade,  $y$  in producing these net exports that Dr. Snow had spoken of. Dr. Snow had a certain phobia against economists; Dr. Isserlis did not claim to have any knowledge of economics, but he was accustomed to the old lesson economists taught, that foreign trade was a thing of value to both sides. If the  $y$  employed in producing the net exports were turned on to home trade, the presumption was that under existing conditions their efforts would not be equally effective. All might guess from time to time what proportion of the population in these islands could be supported under present conditions if the export trade were to be totally abolished. Was it the fact that this country could support 72 per cent., or would a lower figure than 72 represent the percentage of population that could be maintained without foreign trade? There was some notion that if a country did not export, it could still import if it was entitled to receive wages for the services of its mercenaries employed abroad. Great Britain might be said to be entitled to receive tribute for some years to come in return for past investments abroad, and a return for services rendered so long as Mr. Harris and his colleagues continued to carry goods between China and America, but was that sufficient to justify Dr. Snow's lack of pessimism in contemplating further loss of production for export trade?

MR. R. G. HAWTREY said there were one or two points of detail upon which he would like to make observations. First of all, with regard to Professor Bowley's correction on p. 380, he was not quite sure whether it really was an arithmetical error to which he had

called attention, or whether it was not rather a short cut to the result taken by Dr. Snow. The difference between the value at the factory and the value f.o.b. for the *total* output was about £400 million, and he rather assumed that Dr. Snow had taken the same £400 million as the difference for the *net* output, instead of 15 per cent. of the £1,980 million. If that were so, the paragraph did not express his meaning accurately.

There were one or two points about Dr. Snow's estimate of wages that had already been criticized by several speakers. The figures of unemployed were given on p. 381 as 1,000,000 males and 270,000 females in 1924. These were figures of people registered on the books, not merely of those in receipt of benefit. This materially affected Dr. Snow's estimate of poor relief, and the overlapping was much more than it would otherwise have been. Also, Dr. Snow had left out any provision for people absent sick—a figure which Professor Bowley estimated at above 3 per cent.

On p. 381 there were included in those earning salaries and wages, people carrying on business on their own account, amounting to about 2,000,000; surely the whole of these ought to be knocked out of the estimate of wage-earners; it would make an important reduction in the total, which had been criticised as too high.

It would seem that there was an arithmetical error on p. 385, where the wages and salaries appeared to be £2,485 million.\* If £1,500 million were deducted from that figure, the result would appear to be much less than 55 per cent. of the net output.

Turning to a different region of the paper, on p. 400 Dr. Snow said, in connection with the relation of foreign exchange to external trade: "Consignments of leather, for example, having been exported from this country to the United States because the price level over there looked favourable, have been subsequently returned because movements in the exchange made it profitable to do so." Surely that must have been before the gold standard was re-established, because it hardly seemed possible that Dr. Snow would suggest that a variation of  $\frac{1}{2}$  per cent. would result in a cargo of leather being sent back across the Atlantic.

Mr. Hawtrey concurred with several speakers, especially Mr. Lloyd, on the general underlying ideas of the paper, and he thought that Dr. Snow was hardly just to economists as a body in accusing them of an insufficient regard to statistics. Apart from a few individual instances, that was no longer true—particularly if one looked across the Atlantic, where it would appear that the fault was rather the other way.

MR. VIBART wished to make one or two remarks in connection with the paper. It appeared to him that the point from the standpoint of the shipowner as to the relative difference between the cost of bringing goods from the factory to the port as compared with that of moving them from the port to other parts of the earth was partially answered. The figure of 10–15 per cent. for the cost of putting f.o.b. was one that had great authority behind it; at the same time it might

\* Now corrected to £2589 million—E. C. S.

well be considerably on the cautious side; the actual average might indeed be a good deal lower figure, say 5-8 per cent.

Turning to p. 389, he would like to ask Dr. Snow his meaning when he said, "Exotic raw materials enter into our exports of manufactured goods probably to a greater extent than in the imports." It was difficult to know what Dr. Snow was referring to when he spoke about raw materials entering into imports. Then, again, was it adequate to say that exports could be assumed as a random sample of the goods produced? Dr. Snow agreed that it was "not quite true"; could not one go further, and say that in many cases it was not at all true, and that there was but little reason why it should be, especially if commodities were taken in large groups, as in Dr. Snow's Appendix? Taking, for example, the iron and steel industry, galvanized sheets and tinplates—one of the most highly priced sections of the trade—represented roughly speaking no more than a sixth of the value of the production, but nearly a half of the total value of the exports of the iron and steel group. Was one justified in grouping so many different types of commodity together and in arriving at the net output of the exports by applying a uniform percentage?

The following contributions were received after the meeting:—

"While I regard Dr. Snow's paper as an extremely valuable contribution to the theory, there is an idea implicit in two expressions to which I think strong exception may be taken. The first precedes the note (on p. 391): 'this so-called "lack of confidence" is in reality based 'on sound foundations.' The second occurs on p. 395: 'the price of food-stuffs would be "adjusted" to meet our purse.'

"The latter phrase seems to be the common euphemism adopted by economists of the City to excuse the way in which the purchasing power of the primary producers has been forced down since 1920—or at least since 1924. The 'lack of confidence,' therefore, far from being 'based on sound foundations,' has been due to the quite unnecessary fall in prices—the appreciation of the value of gold in terms of which the prices of other primary commodities are expressed."

GEOFFREY BIDDULPH.

"Lack of time and abundance of speakers deprived me of the opportunity of joining in the discussion on the 21st April on Dr. Snow's paper about the 'Relative Importance of Export Trade.' Perhaps, therefore, you will allow me to send in these few observations in writing.

"Put briefly, Dr. Snow sets out to show that this country need not worry much about the reduction in its export trade, and that the fall might go a good deal further than it has done without imposing any real hardship on the community or damaging its 'standards of living.' His opening argument leads to the conclusion that, whereas the export trade has hitherto been thought to represent something of the order of magnitude of 25 per cent. of the country's total trade, really only about 12 per cent. of those gainfully occupied in this

country were in 1924 directing their activity towards export.' Mr. Flux, in the discussion on the 21st April, challenged this estimate and suggested that Dr. Snow had over-stated the total wages and salaries bill of the country. It seems to me that Dr. Snow has also understated the amount of wages and salaries that should be credited to the export trade. He includes in his grand total certain estimates of the wages and salaries paid in respect of the services rendered by the police, school teachers, health officers, finance officials, and numerous other bodies not covered by the Census of Production estimates. This is quite correct, but surely a proportion of these wages and salaries should have been added to the £310 million taken as the wages and salaries paid in respect of exports. I do not know what correction should be made to Dr. Snow's results to meet this criticism and that raised by Mr. Flux, but it will have the effect of increasing, possibly quite substantially, the 12 per cent. mentioned above.

"Dr. Snow then proceeds to console us for the decline in the export trade by telling us first that this trade is a function of the size of population, and secondly, that international trade moves in 'epochs' or 'periods,' and having passed through the coal period, in which our trade naturally flourished, we are now in the oil period and must expect to take a minor place. I do not dispute that there is truth in both these propositions, but I think that Dr. Snow has greatly over-emphasized them. One has only to look at the curves for trade and population during the half-century or more before the war to see that changes in the latter play only a minor part in effecting changes in the former. I would suggest that a more potent influence on international trade is the growth of new wants backed up by the resources to satisfy them.

"Then as regards our trade in the coal epoch, was it really the case 'that up to about the period of the war the supremacy of our economic position based on coal had enabled us *easily to maintain premier position*\* as an exporting nation against the *relatively weak competition*\* which had to be faced'? Has Dr. Snow never heard of the 'Tariff Reform' campaign led by Mr. Joseph Chamberlain, in which one British industry after another was alleged to be disappearing through foreign competition?

"Finally, Dr. Snow produces estimates of how much our exports might be reduced without serious damage to our standard of life. He cuts out further investments abroad, and supposes that we produce for ourselves certain manufactured goods that we now import. If we do that we find that we need to export less than we are actually exporting, and shall still be able to obtain such food-stuffs and raw materials as are necessary 'for our existence at the present level.' But has this proved anything beyond the fact—truism some people would call it—that if you diminish imports you can diminish exports? I fail to see that it demonstrates the maintenance under such conditions of our 'standard of living.'

"I join sincerely with the speakers in the discussion in congratulating Dr. Snow on raising many novel and interesting questions in his paper."

A. D. WEBB.

\* My italics.

DR. SNOW acknowledged the vote of thanks, and in view of the lateness of the hour stated that he would deal in the *Journal* with the points raised in the debate :—

(1) A number of the points raised in the discussion relate to the actual figures mentioned in the proof of the paper circulated at the meeting. That proof was uncorrected, and in the process of correction certain modifications in the figures have been made and improvements in phrasing introduced in order to bring out the distinction between (a) "net exports" and (b) "national net output" in exports. The former is the total value of the exports less the value of the imported materials contained in them, and the latter is the aggregate of the "net outputs" in the census of production sense in the goods exported worked out in the manner shown in the Appendix. If our data were perfect the two methods would lead to approximately the same result, since each measures the value of the wages, salaries and remuneration of capital involved in the exports. In the proof of the paper these two methods were explained and illustrated, but without the use of a distinct terminology. In the revised form, however, the two methods have been treated as two distinct problems and the results given by each averaged, this average being taken as the measure of the wages, salaries and remuneration of capital involved in the exports. In the proof of the paper used at the meeting, the figures of £550 million and £600 million were given as approximations for the figure measuring the wages, salaries and remuneration of capital involved in producing goods for export and in transporting them to the ports and the average £575 million reached. In the revised form the figure taken for this is £560 million; the "national net output" contained in exports being £550 million and the "net exports" being £575 million.

(2) *The Total Wages and Salaries paid in this Country.* Two points are involved in this : (a) the proportion of the total net output of industry and agriculture representing wages and salaries, and (b) the total wages and salaries for those services which were not included in the census of industry and that of agriculture. With regard to (a), I reached the figure of 55 per cent. by a certain method in the paper. Professor Bowley referred to other data on the subject which I had not used, but the use of these data lead to a figure quite close to this percentage. The wages census taken in 1924 was unfortunately not a complete one, covering 3,119,000 males and 1,086,000 females out of 5,159,000 male and 1,699,000 female wage-earners covered by the census of production. There are various ways in which the data given by the wages enquiry may be treated as a sample of the whole, but the results are very similar. Mr. Brown in the paper referred to by Prof. Bowley (*Economica*, December 1928) found that for industries with a net output of £1,280 million (out of a total of £1,750 million) the percentage of wages to net output was 44·7. We can add to this the results for further industries not summarized by Mr. Brown (net output £175 million, wages £118 million) and coal-mining (net output £210 million, wages £162 million), and get a grand total of £852 million for wages corresponding to a net output of £1,665 million. Thus, results covering 95 per cent. of the net output of

industry give a proportion for wages alone of 51 per cent. No similar enquiry was made in 1924 regarding wages paid in agriculture. Judging by the *rates* of wages, the percentage of wages to net output in agriculture is below 50 per cent. but the net output of agriculture as a whole is only 14 per cent. of that of industry plus agriculture. For the two together, therefore, on this basis of estimation the proportion of wages alone to net output may be slightly, but not much, below 50 per cent. In the paper I took the figure of 55 per cent. for wages *plus* salaries. We have no figures regarding the salaries paid in industry; the number of salaried persons, however, was 755,000 as compared with 6,858,000 wage-earners. It is certain, therefore, that the aggregate amount of the salaries was more than 10 per cent. of the aggregate amount of the wages, and this would lead to a figure probably rather in excess of 55 per cent. as the proportion of wages and salaries to net output in industry and agriculture. Until we have further information regarding salaries we cannot calculate the true percentage with accuracy, but even if we take a figure as high as 60 per cent., no significant alteration is made in the value of the fraction :

$$i_w + a_w + s_w$$

With regard to (b)—the total wages and salaries for those services which were not covered by the census of industry and agriculture in 1924—a number of criticisms have been made of my estimate. The chief is that of duplication, *i.e.* that some of the people in the "services group" (as distinct from the "industrial" and the "agricultural" groups) are indirectly paid for in the net output of industry. Mr. Flux instanced the case of the newspaper industry, whose net output includes payments made to news agencies. I fail to see that this item can give rise to any substantial amount of duplication in comparison with the large totals involved, and I cannot see that there is any large amount of duplication of a similar nature in other industries. It might conceivably arise when a manufacturer has his own retail distributing shops (*e.g.* multiple boot shops) if he returned in the census paper (sent to the factory) the selling value as determined at the retail shops. This would be contrary to the instructions issued, however, and so far as I have been able to find out, in such cases the census form is specifically associated with the "factory" and not with the business as a whole. Another form of duplication is possible. The salary of, for example, an accountant or solicitor employed full time by a manufacturer is included in the "net output" of the manufacturer. If such accountant or solicitor is subsequently included again in the "services" group there certainly will be duplication. But the figures which I used were not those of the "*occupation*" census but of the "*industrial*" census. If the accountant or solicitor were employed, say, by a chemical manufacturer, and made a correct return at the census of 1921, he would not appear in the "industrial" census under the heading of "professions," but under that of "chemical industry," and there should be no duplication involved. There would be a certain amount



of duplication, however, in respect of, say, an auditor or a solicitor who is consulted by a manufacturer. The fee in each case would be included in the net output of the manufacturer, and if the entire earnings of the auditor or solicitor came from such sources it would be wrong to include him in the "services" group and to credit him with the average income assumed for that group. Whether in getting the figure for the total of wages and salaries in the country this duplication is fully compensated for by the fact that the item for salaries in industry and agriculture appears to be an understatement, and further that the average salaries for the various professional groups were, in the paper, in each case taken on the low side, it is impossible to say. At the moment I see no reason for making any substantial alteration to the final figures in the paper on this account, but I should like to take the opportunity of emphasizing that there exist a number of uncertain factors in the different methods which have been used for determining the national income. After close study of the problem I feel satisfied that Mr. Flux's estimate of the value of the "other services" was substantially below the mark. He had before him the estimate of Bowley and Stamp of the national income, and having fairly accurate figures of that part of it due to industry and agriculture he was possibly unconsciously influenced by their estimate in making his own of the balance. I consider that the estimate of Bowley and Stamp is too low, and in particular that it under-states wages plus salaries as a proportion of the total. But there is undoubtedly need for better information regarding the aggregate earnings in the "services" group and the extent to which there is duplication between this group and the industrial one. Pending this further information, however, I cannot see what substantial modifications can be made in the figures in the paper.

(3) *The Proportion of Salaries to Wages.* A number of the points raised in the discussion have bearing upon the proportion of salaries to wages paid in this country. I know of no reliable data on this point. Dealing with *industrial output*, I made the statement that salaries, "it is fairly certain, exceed 10 per cent. of wages." Prof. Bowley in the article in the *Economist* referred to in the paper estimated the number occupied in connection with export trade at 2,330,000, "of whom 230,000 were salaried," while Mr. Flux has pointed out the figure given in (2) above showing the number of salaried workers in industry as about 10 per cent. of the total. I considered that these statements justified my taking salaries *in industry* at not less than 10 per cent. of wages. Mr. Flux and others in their remarks on the paper, however, have taken the figure of 10 per cent. and applied it not merely to the industrial and agricultural section but also to the "services" section of the community. In this "services" section the proportion of salaries to wages must be much higher than in the "industry" section—in some of the professional occupations included in "services" the proportion of salaries must be nearer 90 per cent. than 10 per cent. I can see no way of accurately determining in my total figure of approximately £2,500 million for wages plus salaries the individual items for wages and salaries separately, and it is no

criticism of this particular figure, therefore, that it is not in accordance with some other estimate which has been given of the national wages bill. The criticisms are based on the assumption that the wages item in my estimate of the "services" is £1,350 million and salaries £150 million. I doubt whether the wages under this heading amount to £500 million. Mr. Hawtrey referred to this point in connection with the 2,000,000 people carrying on business on their own account. I should not refer to these as wage-earners, though I included an estimate of their "remuneration." This brings out what I consider, however, is a very important matter regarding the proportion of remuneration for services (salaries plus wages) to remuneration of capital (profits). In the estimate of Bowley and Stamp based on income tax returns I understand that the income of those people would fall under the head of profits on the capital they have invested in their particular business. But is this really justified? If a man puts his savings of £500 into a shop and by arduous work makes £200 at the end of the year, is it proper to term this profit? I would admit £25 as profit, but the balance would be more properly included under "salary" as remuneration for the work he has performed. In pre-war days I understand it was not uncommon for the Managing Director of a large business in which he held nearly all of the shares to take nothing out under the heading of "salary," but to receive all his remuneration under the heading of "profits." Subsequently the distinction between "earned" and "unearned" income became much more important, and such men gave themselves a fixed salary (on which tax was paid at the "earned" rate) and received subsequent income from profits (on which tax was paid at the "unearned" rate). The same issue is involved now with the many people who are working on their own account, even if they have one or two others to assist them. The question of the division of the national income between "wages and salaries" on the one hand and "profits" on the other is of considerable public importance, but in the light of present published information it hardly seems possible to feel great confidence in the estimates which have been made from time to time regarding their relative importance.

(4) *The Proportion of Imported Materials in Articles Exported.* The determination of "net exports" requires a knowledge of the imported materials involved in producing the goods exported, and there appears to have been some doubt as to the methods used in making the calculations on this point in the paper. The figure of 25 per cent. which was mentioned was not the one by which the proportion was actually ascertained. It was the starting-point, and the object of the discussion on this point in the early part of the paper was intended to show that this particular figure was not the correct one to take. The proportion of the imported raw and semi-manufactured materials to the total industrial and agricultural output (free of duplication) in this country is 25 per cent., but the exports are not a random sample of the industrial and agricultural output. The case of cotton was discussed in detail as an illustration. By a general calculation and without treating in detail the complications introduced by the dyeing, finishing and packing sections of the

cotton trade. I reached the figure of £87 million as the amount of imported materials involved in the cotton goods exported from this country in 1924, and this is the figure referred to by Mr. Flux. Subsequently more detailed calculations were made, and these led to the figure of £77 million, and the text has been amended to indicate the nature of these calculations. The deductions drawn from the final result of the paper, however, depend only to a small extent on the absolute accuracy of the individual estimates for separate industries. They are subject individually to an appreciable degree of error, but the fact that the aggregate figure for "net exports" is reasonably close to that of "national net output" in the exports is evidence that the errors in the calculations for individual industries tend to cancel out in the aggregate.

(5) *Charges from factory to f.o.b.* This point was mentioned in the debate, and Mr. Harris in particular commented upon the high charges on inland transport compared with overseas transport. It should be emphasized, however, that the 15 per cent. added to the "factory" price to get to the "f.o.b." price of exports includes merchants' profits, commissions, port charges, etc., in addition to transport, insurance, etc. I accepted this figure of 15 per cent. which had been adopted by Mr. Flux, based upon enquiries made in 1924. It must be extremely difficult, however, to make an accurate estimate under this heading for the aggregate of goods exported, since there is great variation in the figure for different commodities. In the case of coal it must be very much more than 15 per cent., though in the case of leather it is less. This subject is worthy of a detailed investigation, as accurate information regarding it is particularly important at the present time.

(6) It was not an easy matter to find a title for the paper, and it is clear from the comments which have been made that it has been considered to have wider scope than was intended. Some of the critics appear to have read the title as "the absence of importance of the export trade." I hope that it is clear to careful readers that I do not hold the view that we should not do our utmost to extend external trade. The division between export trade and internal trade, however, is merely determined by political frontiers. There is no extra virtue added to trade between this country and the Irish Free State since 1923 merely because it is now included under the heading of imports and exports. An appreciable proportion of the increase in international trading between 1913 and 1930 arose through new political frontiers in Europe. If it is the proper thing for, say, a Leicester boot manufacturer to strive his utmost to "recapture" the market for shoes in South Africa which has been "captured" by a Czechoslovakian manufacturer, surely it is also the proper thing for him to strive to "recapture" the market lost to the same competitor in the south of England, where in fact, he should stand a little better chance of succeeding. I agree with Dr. Isserlis and others that there are other aspects to be taken into account in a comprehensive national survey of the problem. But my task was to estimate the remuneration of those engaged fairly directly in connection with export trade as a proportion of the total remuneration in the country. I agree

that the British sailor serving on a ship importing cotton to Liverpool is assisting towards the export of cotton goods, and that a school teacher teaching a boy who will end in using the knowledge he has acquired in making, say, a motor-car for export is also assisting in the development of the export trade, and that a portion of the remuneration in these two cases should strictly be included in the numerator of the fractions I discussed as well as including the whole of it in the denominator. But these two people are not "directly" engaged in the export trade. If one were confident about the accuracy of the data on which the estimates in the paper were based, one could aim at greater refinement and make allowances for these "second-order" factors. For the present, I think it is best to attempt no estimate, but to recognize their existence.

As a result of the ballot taken during the meeting, the candidates named below were elected Fellows of the Society :—

Donald Beaton.

Egon Glesinger.

Keky Merwanji Kheshvala.

*Corporate Representative :*

J. C. M. Eason, *representing the Statistical and Social Inquiry Society of Ireland.*

## MISCELLANEA.

## THE AMERICAN CENSUS OF DISTRIBUTION, 1930.

By IRIS DOUGLAS, M.A.

*(Based on a paper read before the Study group on January 6th, 1931.)*

AN interesting experiment has recently taken place in the statistical investigation of a field hitherto hardly explored, that of the retail and wholesale system of distribution. The United States of America has taken, first a sample, and then a nation-wide survey of the channels by which goods pass from the manufacturer into consumption, and the outlets by which they finally reach the consumer. This census is also interesting from the point of view of the intention behind it. The numbering of the population and the investigation of productive capacity had their origin in the political need for examining the taxable capacity of the nation. This American numbering of shops and agents and the evaluation of the trade they conduct was due to a belief that business can be conducted more efficiently if it is based on a thorough market study covering not only producers and consumers but the whole machinery of exchange. So successful was the sample enquiry that the national census was undertaken without hesitation. Nor was realization of the value of the statistics confined to the United States; Canada immediately followed suit and the Census of Distribution in that Dominion is now in progress.

Few European countries have collected statistics of retail trade. The very detailed Danish figures of retail turnover classified by locality and type of shop are unique. The index figures of retail trade recently inaugurated under the auspices of the Bank of England and published monthly in the *Board of Trade Journal* were received by the business world with all the interest of a complete novelty. In the United Kingdom there is no central accurate count of the number of grocers, drapers, ironmongers, etc.; still less is there any information regarding the number of shops of different kinds selling any given article such as soap, matches, or razor blades, so that the best use cannot be made of the distributive system. Discussions of the growth of the multiple shop movement contain widely differing estimates of the proportion of trade handled by such organisations, and indeed estimates of the total consumption buying of the population of these islands have to be based on probable *per capita* expenditure, since figures of turnover simply do not exist.

In these circumstances the American experiment naturally suggests that similar experiments should be carried out in Britain, and in other European countries if these countries are to consider themselves progressive in commercial matters. The occasion, methods, and results of the United States Census accordingly require examination to see what modifications would meet British needs and increase the efficient conduct of British business in the home market. It was in 1925 that a Distribution Conference in Washington, at the suggestion of President Hoover, then Secretary of Commerce, appointed a Committee of Business Statistics, which, in addition to summarizing the sources then available, began a series of conferences with the various statistical divisions of the Federal Government to consider the best means for supplementing such data as were being collected by any existing body. It soon became apparent that there were in existence only incomplete and, in the main, unsatisfactory figures concerning merchandise distribution. There was no Government department prepared to undertake the collection of such figures, nor could the collection take place without a specific authorization. A sub-committee was then appointed to conduct a trial census in a limited number of cities. Mr. M. C. Rorty of the American Telephone and Telegraph Company was first appointed chairman, but, on his being called out of the country by business, that office was undertaken by Dr. Paul T. Cherington of the J. Walter Thompson Company. The other members of the sub-committee were Henry A. Dennison, Prof. Edwin F. Gay, and Mr William M. Stewart, Director of the Bureau of the Census. It will be seen that from its inception the investigation proceeded by co-operation between business men, academic economists, and the appropriate Government department. The Chamber of Commerce of the United States also took part, both in securing the collaboration of business men in the cities concerned and in preparing reports on the data when gathered. In 1927 the actual trial census took place in eleven cities, the enumeration being carried out by a staff employed by the Census Bureau, working in connection with the local commercial bodies. Results were published in 1928, and so valuable did they prove and so well were they received by the business world that immediately steps were taken for a national survey to be carried out by the Bureau of the Census. Chambers of Commerce and other business groups co-operated as before, especially in the necessary and valuable work of convincing the two million retailers and wholesalers that, on the one hand, the information provided would be of assistance to all who were competent to use it, and that, on the other hand, no individual figures could be divulged or any individual injured by the provision of information.

The schedules used in the national census were very detailed, containing about 200 questions regarding the location and type of business, the employees, the total stocks, the kind and volume of sales, etc. The chief items of expense were asked for, but no attempt was made to discover the amount of profit, so that any personal reluctance on the part of retailers to help was minimized.

The basic statistical information to be secured was of three kinds :—

(1) A count of the numbers of distributors, classified geographically by kind of merchant (retailer, wholesaler, agent, etc.); class of business (groceries, hardware, etc.); volume of sales; and character of ownership (individual, co-operative, multiple, etc.).

(2) Volume of sales, classified geographically by classes of commodities, number of outlets, etc.

(3) Stocks; age of business; employees—by sex; seasonal variation: in full-time and part-time employment; wages; salaries, rent and other expenses; credit and instalment sales; etc.: all of these classified geographically by kind and class of distributor, size of establishment, etc.

The form sent out with the schedules suggested that the information obtained could be put to various important uses, the outstanding ones being four :—

(1) Individual distributors can use the information to compare their own businesses with the group average.

(2) Merchants' associations can use it to further their group interests.

(3) Manufacturers and their associations can use it in planning their marketing and sales policy.

(4) In general it can be used to show the strengths and weaknesses of the distributive system and to aid in the elimination of waste.

Though information for specific localities and commodities has been steadily released, the complete report is not yet issued. In the meantime the results of the "Sample" are worth attention, covering as they do nearly 94,000 retail establishments doing a total business of about £800,000,000. The most remarkable fact revealed is the proportion of trade done by small, medium, and large shops. The little shops with annual turnovers of less than £1,000 amounted to 28.06 per cent. of the 79,778 independent shops enumerated, yet handled altogether only 1.68 per cent. of the total independent trade. Their share of the total retail trade of all shops was only 1.17 per cent. While those with a turnover of £10,000 and over numbered only 11.34 per cent. of the total, their trade formed 70.53 per cent. of the

whole. Forty shops with a turnover exceeding £1,000,000 per annum, representing only 0.05 per cent. of the total surveyed, handled 16.43 per cent. of the total trade. The proportion handled by multiple shops is also striking. Of the 93,928 establishments, 15 per cent. were branches of multiple shops, and these accounted for nearly 29 per cent. of the total retail business.

Those proportions naturally showed considerable variation in different trades. Thus, 93.52 per cent. of departmental stores did a trade in excess of £20,000 per annum; 70.60 per cent. of the automobile shops had a turnover of £10,000 or more, while at the opposite extreme, only 2.11 per cent. of the cigar shops, 1.21 per cent. of the confectionery, ice-cream, and soft drinks shops, and 4.24 per cent. of the petrol and oil stations reached the £10,000 level of turnover. Convenience shops are mainly in the class under £10,000. The size of the unit of sale is clearly a factor in determining the proportion of large shops in any trade.

Examples of the variation in the degree to which multiple shops control different trades are furnished by the large proportion of chain shops in variety stores (55.1 per cent.), petrol and oil stations (46.4 per cent.), men's and boys' hats and caps (33.7 per cent.), grocery and delicatessen shops (21 per cent.), in comparison with the small proportion in such trades as bespoke tailoring (1.9 per cent.), motor bicycle and cycle (3.4 per cent.), and art and antique shops (4.5 per cent.). A somewhat unexpected difference is that 25.1 per cent. of automobile shops are multiples, and only 3.4 per cent. of motor bicycle and cycle, and conditions elsewhere may well show proportions dissimilar from these. In general some trades do seem more amenable to multiple shop organization than others.

The distribution of the retail dollar by commodity groups is also interesting. It seems unlikely to be applicable to European conditions, for it was found that for these 11 cities 9.56 per cent. of the total retail outlay when analysed into 69 commodity groups went for grocery and delicatessen; the second item, automobiles, took 6.45 per cent., and the third, ready-to-eat meals, 6.35 per cent. Women's outerwear came fourth with 4.74 per cent., meat and poultry fifth with 4.37 per cent. Summarizing the 69 classifications into 13 groups, food with 28.51 per cent. of the total, clothing with 24.29 per cent., automobiles with 12.10 per cent., and furniture and house-furnishings with 9.84 per cent. account together for 84.74 per cent. of the retail trade. Except for the thirteenth group—"all others"—which has 6.69 per cent. for its share, none of the other groups reach 5 per cent. of the total.

Manufacturers who are ever seeking new channels to the public for their goods, and have seen the recent changes in the retailing of



stockings by shoe-shops, razor-blades by tobacconists, groceries by dairies, and wireless accessories by bicycle repair shops, will note with interest the variety of outlet shown by this census. Boots and shoes were distributed by no less than 27 trades in these cities, but even that variety was surpassed by books and magazines, on sale in 31 different kinds of shops, sweets, ice-cream, and soft drinks sold in 32 different kinds, and cigarettes in 33. In some cases the juxtaposition of different lines is almost ludicrous, as when a grocer's shop supplies coffins, restaurants do a secondary trade in footwear, and petrol stations sell musical instruments. In other cases, the lines are linked by a more or less obvious suggestion that the need for one implies a need for the other—*e.g.* seeds, tools, and fertilizers.

Geographical statistics from a trial census have, of course, little comparative value, and the publication of national results has not yet supplied comparative figures of this sort. It is clear, however, from a survey of eleven cities that considerable geographic variation may be expected. Trade of different kinds will concentrate on different towns as distributing centres, and a given type of shop will be more important in one locality than another. For example, motor shops accounted for 20.65 per cent. of the total retail sales in one town and only 4.56 per cent. in another, and departmental stores led the way in Chicago with 17.89 per cent. of that city's trade, although in Kansas City they accounted for only 6.16 per cent. of the trade. The money value of sales per shop indicate that while the average sales per shop in one kind of business are high in a certain city, the sales of another type of shop are low. In Seattle, for instance, the average hardware shop does only one-sixth as much business as the average Atlanta hardware shop, while the yearly sales of fruit and vegetable shops in the former city are more than twice as much as in Atlanta. Grocery shops show one of the smallest ranges, the sales per shop in different towns varying less than 18 per cent. in either direction from the average of the whole eleven.

Such statistics as these can be utilized advantageously by manufacturers and wholesalers in planning the economical distribution of their goods. At first sight the retailer himself does not appear to benefit. The efficient retailer can, however, use trade statistics to measure his own achievement and the prospects before him, and so minimize the costs of his establishment. It is also probable that manufacturers and wholesalers, knowing the average sales per shop, will prevent their travellers from persuading retailers to carry over-large stocks, a proceeding which has often been the first step to business failure. In this connection the case of a town which conducted a detailed survey of its grocery trade may be cited. In 1929 it had fifteen bankruptcies, in the bad year 1930, after the

publication of the survey, there were only three. Such a reduction may be fortuitous, but it is attributed by American observers to increased efficiency due to study of the survey by the retailers concerned. The national Census of Distribution now being taken in America is therefore regarded as a step towards the rationalization of the distributive trades, substituting ascertained fact for guess and estimate as the basis of distributive policy.

## REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Introduzione al Metodo Statistico*. By Felice Vinci. 10" × 7". 191 pp. Padua: Cedam. 1930. Price 25 lire.

Professor Felice Vinci is known to statisticians both as an original investigator and the author of a text-book (*Statistica Metodologica*, Padua, 1924) containing an exceptionally lucid exposition of the fundamental schemata of probability. The scope of his new volume is rather more restricted, for it is based on lectures to students of the juridical faculty of the university of Bologna, and mathematical discussions are, so far as possible, eschewed, the author seeking to make the methods clear by means of arithmetical examples. The first three chapters discuss general principles and the tabulation of data in a clear and interesting way. Chapter IV, which is profusely illustrated, describes graphical representation. Chapter V contains a very good account of the most important averages and measures of variation. The last and longest chapter is devoted to graduation and interpolation. Here, perhaps, the author has attempted the impossible. He wished to explain to students without mathematical training the fitting of parabolic curves, and, probably on that account, in treating of the problem of successive approximation, has included Cauchy's method but omitted the arithmetical details of the much more satisfactory method of Chebysheff. But a reader who does not understand the elementary notions of the infinitesimal calculus must take the "normal" equations of Least Squares upon trust, and if faith is to be instilled by arithmetical illustration, the neat arrangement of the Process of Chebysheff, as set out, for instance, by Dr. Isserlis (*Biometrika*, XIX, 1927, 87) is quite convincing. However, we should like to believe that students in the

Faculties of Laws of our own universities will, one day, learn as much about statistics as Professor Vinci teaches at Bologna.

M. G.

2.—*Les Principes de la Méthode Statistique avec quelques applications aux sciences naturelles et à la science des affaires.* Par Lucien March.  $9\frac{1}{2}'' \times 6\frac{1}{2}''$ . xi + 807 pp. Paris: Librairie Félix Alcan. 1930. Price Frs. 125.

The author of this book has evidently set himself the task of writing a comprehensive elementary text-book on statistical method. In this task he has undoubtedly succeeded.

The book cannot but be regarded as comprehensive when the reader is given the fullest explanation of every point that arises, even at the cost of introducing much that belongs purely to elementary mathematics and economics. It cannot but be regarded as elementary when no use is made of the calculus and direct reference to the theory of probability is reduced to a minimum.

After an introductory chapter which contains in the footnotes a number of interesting aphorisms quoted from other writers, the book is divided into three main divisions:

- (1) Observation and Classification.
- (2) Statistical Analysis.
- (3) Applications.

The first part occupies two hundred pages and contains chapters on observation, description, and symbolical or graphical representation, on units, on methods of collecting data, on the control and criticism of data collected, on accounting, on summarizing by means of statistical tables, and on technical classification.

On going through these pages one is struck by the amount of elementary algebra included; for example, the rules of signs and of indices, elementary graphical notions, and the relation of errors in a sum, difference or product to the errors of the components. In one place in this elementary discussion we find the following sentence:—"Les puissances supérieures à 3 ne peuvent se représenter dans l'espace; on ne peut en former que des représentations mentales offrant quelque analogie avec les représentations spatiales, mais qui n'offrent pas d'application utile pour la statistique." In view of the great part that the geometry of space of  $n$  dimensions has played in modern statistical theory—particularly in the theory of small samples—this remark, unless read very strictly in connection with the context in which it is used, might convey a very misleading impression.

However, the main object of this part of the book is to give practical information on the way to observe, to collect and to classify data and on the various precautions which must be observed. In achieving this object it is undoubtedly successful.

In the second part of the book, which deals with statistical analysis, there are chapters on simple comparisons, on more complex comparisons and symbolical representation, on the comparison of aggregates, three long chapters on the variability of groups which

really introduce the theory of sampling in a somewhat disguised form, one on the binomial which leads on to another that introduces the normal curve, one on graphical representation and one on graduation, interpolation and extrapolation.

A good point is made in the first chapter, where the importance of not pinning one's faith to any one pet ratio in a statistical study is emphasized: "*les rapports que l'on peut établir quand on compare deux caractères d'un phénomène déterminé, n'éclairent qu'un aspect particulier de ce phénomène; ce n'est qu'en les multipliant qu'on peut analyser le phénomène sous ses divers aspects*"—a point which might be borne in mind with advantage by any worker in biological science who feels tempted to invent a new index.

But a part of this chapter and the whole of the following chapter is really devoted to elementary algebra. It is something of a novelty in a work on statistics to find proofs of such properties as the expression for the sum of the squares of the first  $n$  integers or the formula for  $\cos(a + b)$ .

The next two chapters, which discuss the comparison of aggregates and variability, deal, perhaps in a rather more general way than is necessary with arithmetic, geometric and harmonic means, with the median and other deciles, and with an average which will be new to many English statisticians—the "medial" (*médiale*).

Supposing we have a frequency distribution of salaries, the median is of course the salary at which half the workers get higher and half lower salaries, but the medial is the salary at which as much money is paid to those who get more as to those who get less. In a frequency distribution of stature the median divides the population into two equal groups, but the medial divides the total aggregate stature into two equal groups. Similarly we may have "quartals" as distinguished from "quartiles."

Some attention is given to averages and co-efficients which depend upon the differences of all possible pairs of observations and on the differences between observations consecutive in order of magnitude, as well as the more well-known ones which depend on deviations from the mean.

We next come to some very long chapters on sampling; they seem to deal with the subject with rather unnecessary prolixity and repetition; each proposition is repeated in words at the end and is accompanied by a numerical example using very small numbers.

Chapter XIII deals with the determination of the mean and variance of the mean of an unstratified and of a stratified sample from a limited population. In the stratified sample we take a definite number of individuals out of every class in the universe. The author also considers the case where we take all the individuals from a certain number of classes, but only works it out in detail where the numbers of individuals in all classes in the universe are equal.

In the following chapter it is supposed that we start with a number of primary series of different size and that we sample by taking one member out of each series. Expressions are then found for the first four moments about their own mean of the means of the samples. These results are then used to prove the Bienaymé-Tchebycheff

theorem. Since the only practical results of importance are obtained by assuming the  $n$  primary series to be identical, this seems rather a complicated way of getting the sampling results. However, for a fixed population mean we are shown that the variance of the sample mean is least if the primary series are all different, somewhat greater if they are all identical and greatest of all if they consist of groups of identical series.

In Chapter XV the binomial distribution is developed by use of the notions of the preceding two chapters in a manner which seems cumbersome compared with its direct development from elementary probability-theory. This distribution is discussed in a more practical way in the following chapter, and the derivation of the normal-curve from the binomial is suggested.

A chapter on graphical representation follows and one dealing with some simple examples of graduation processes, least squares in particular, applied to fitting a straight line, a parabola and logarithmic and periodic curves.

We now come to the third part of the book dealing with applications. The first two chapters deal with simple comparisons and elementary numerical applications of frequency-distribution ideas. The uses of arithmetic and geometric means, of the median, modal, mode, and deciles, of the standard-deviation and of the coefficient of variation are well illustrated. These are followed by an interesting chapter on sampling in which the distinction between a random and a representative sample is clearly explained. We have here two interesting examples, one from French and the other from Danish official statistics, and a third one, perhaps less clear, dealing with the homogeneity of a manufactured product.

Then comes a chapter on correlation in which, in our view, a disproportionate amount of space is devoted to discussing the coefficient

$$Z = \frac{N' - N''}{N' + N''}$$

(where  $N'$ ,  $N''$  are respectively equal to the number of cases in which the derivations of the two variates from their means are of like and of opposite sign), and to the conditions under which it will be equal to the ordinary coefficient of correlation. The correlation ratio and the coefficient of mean square contingency are touched on, and there is a brief reference to partial correlation involving two variables and, we think, a hardly adequate treatment of the sampling errors of the correlation coefficient.

We then come to a chapter on index-numbers and one on applications to natural science. Here a number of miscellaneous examples are collated and—considering the length of the book—treated in a disproportionately brief manner.

The book concludes with five chapters on applications to business and commerce in which there is much that belongs, perhaps, more properly to business economics than to statistics. The determination of selling price, the study of balance-sheets and cycles and forecasting are among the subjects treated. There is some interesting discussion

of the complementary functions of statistical and accounts departments in a large industrial concern—functions respectively of recording and analysis which are very different, but the harmonious co-operation of which can be of great advantage to the organisation.

On coming to the end of these 800 pages, one cannot help thinking how much better it is that the student should master a reasonable amount of elementary mathematics first and not have his study of statistics arrested at almost every step by somewhat tedious explanations of points of elementary algebra or disguised probability-theory. Further, the form of this book has itself resulted in a good deal of repetition, and it is to be feared that the reader after going through the theory of Part II and coming to the examples of Part III may find he has forgotten the theoretical points on which the examples depend. Nevertheless, he should be more than grateful for the great amount of information here afforded him in an elementary form—a form which will largely obviate reference to other books in the course of his reading.

J. O. I.

3.—*Numerical Mathematical Analysis*. By James B. Scarborough, Ph.D., Associate Professor of Mathematics at the U.S. Naval Academy.  $9\frac{1}{2}'' \times 6\frac{1}{4}''$ . xiv + 416 pp. Baltimore: Johns Hopkins University; London: Milford. 1930. Price 25s.

There are four main respects in which this work will appeal to prospective buyers: (1) it covers the ground without demanding an inordinately high standard of mathematical attainment; (2) at every stage it is illustrated by fully worked-out examples; (3) especial attention is given to the question of the degree of accuracy attainable by the methods described; and (4) it deals fully with the troublesome subject of the numerical solution of differential equations.

On the other hand, it is difficult to account for several omissions. Neither Everett's nor Lubbock's formula appears to be mentioned. Divided differences may not often be used in practical work, but when they are required, their very unfamiliarity makes a careful analysis of the process imperative. As examples of other matters that might usefully have been included, one may cite formulæ of subtabulation, graduation, determinants, and correlation.

The plan of omitting proofs of more difficult formulæ, e.g. Euler's quadrature formula, is to be deprecated, and this criticism applies more particularly to unfamiliar methods such as the Runge-Kutta and Milne methods of solving differential equations.

We miss the elegance and compactness of Whittaker and Robinson's *Calculus of Observations*, and whilst unhesitatingly recommending the present work as a useful supplement to the former, we would not suggest it as an alternative.

There are two ways in which explorations in the technique of numerical mathematics appear fruitful. There is the development of self-corrective processes, by which computers' errors at any stage tend to be automatically eliminated; and there are investigations into the comparative rapidity of quasi-analytical methods and methods of pure trial and error. Guessing a solution and working

backwards may lack mathematical polish, but it frequently leads to practical results in less time than would have been consumed by more elaborate processes.

L. R. C.

4.—*Doodsoorzaak en Statistiek*. By Dr. M. G. Neurdenburg. 10"  $\times$  6½". 248 pp. Amsterdam: H. J. Paris. 1929. Price 12s. 6d.

NEITHER the subject of this book nor its language will allure those English statisticians who know no more Dutch than does the reviewer, and are even less interested in the vicissitudes of the International List of Causes of Death. Actually, the first part of the book (the last 100 pages are too technical for the general reader) can be thoroughly enjoyed by anyone who cares for statistics at all, because the history of medical statistics is in miniature the history of all statistics. One begins with a purely utilitarian object; certification of causes of death is a precaution against crime. Then it appears that the information furnished might be material for scientific investigation, and, in seeking to improve and extend that information, one is brought up against the ethical and, in some countries, legal difficulty of professional secrecy and must reconcile the scientific and ethical aspects by a method of confidential certification. *En route*, as statisticians become "class-conscious," there will be the difficulty of deciding whether those who provide the data or those who analyse the data are to decide what the data really mean. Finally, there will be the greatest difficulty of all, viz. that of persuading different nations to adopt a uniform system. All these stages have been passed through—or are being passed through—by all varieties of official statistics, and Dr. Neurdenburg has set out the history of official medical statistics in a most attractive way. His account of the evolution of medical statistics in the Netherlands is complete but by no means tedious, and his discussion of the present method of confidential certification there and his comparison of the Dutch, Swiss and English methods are instructive. His history of the—let us call them—*negotiations* between the various national, international and more or less supranational bodies eager to have fingers in the pie of decennial revision of nomenclature is completely documented and salted with a quiet humour which even those of us who read his book with a dictionary on the table can appreciate. With regard to classification, it is pleasant to notice that Dr. Neurdenburg, although he impartially summarizes the views of all the authorities, plainly sympathizes with Dr. Stevenson's opinion, expressed at one of our meetings, that "the results of determining above the certifier's head what his patient died from are artificial and intrinsically absurd. I cannot sit in an office in Somerset House and say that a patient certified as dying from measles died from small-pox, and yet if he dies in a small-pox hospital, that is what our present rules assume."

In short, this is a very good book, and an English translation, abbreviating some of the later part and adding a précis of the findings of the conference of 1929, would be worth doing, if, which is extremely improbable, a competent translator could be found.

M. G.



5.—*The Tables Turned*. By James Bonar, LL.D., F.B.A. 8½" × 6". vii + 136 pp. London: Macmillan, 1931. 7s. 6d.

All that was needed to write this book was to master thoroughly the writings, public and private, of the great British economists, to collect every shred of evidence as to their lives and personalities, to devote half a century to the study of economics, philosophy and politics, and to have the energy, capacity and inclination to give us imaginary conversations with the old masters, in the light of modern knowledge, infused with a wit and wisdom which make the dialogues worthy of the speakers. Dr. Bonar is unique in combining these qualifications and gives us a tit-bit by a connoisseur for connoisseurs. We are introduced in turn to the shades of Adam Smith, in the Elysian Fields, to Malthus and Ricardo re-visiting the glimpses of the moon to appear in a dream to an economist of to-day, and to John Stuart Mill in Hades. But though we have to deal with ghosts, and the turning of tables is a spiritualist feat, the book is only in the French sense *spirituel*. If an epigraph were needed for it, the old tag might serve: *Tempora mutantur et nos mutamur in illis*. The whirligig of time has brought Labour to the front in politics and economics. 'Labour, once downtrodden, then defiant, now dominant or even at times domineering, causes a vast body of economic questions to be reconsidered' (p. 16). How far do the four great men react to the inquiries? What modifications to their doctrines are necessitated by these changed conditions? The reader must be exceptionally gifted if he can get out of these conversations half as much as is put into them, and exceptionally industrious if he follows up the allusions which crowd each other so closely that in the brief compass of 131 pages more than two hundred names are mentioned. This allusiveness is so condensed that we may suppose the shades, like the Ghost of Hamlet's father, to have been pressed for time in the interviews they accorded.

An especially delectable morsel is the section on Adam Smith among his Books—his library and not his writings. Here the bibliophile will find references to a great number of the volumes still extant which bear the Sage's bookplate. Of these we know about a thousand, many of them of economic interest, and the colloquy between Adam Smith and the Victorian interviewer on the subject of these books and their influence upon Adam Smith is in the happiest vein.

There are some references to statistics and the Royal Statistical Society. Adam Smith's low opinion of Political Arithmetic does not show contempt for statistics, which he himself handled shrewdly, but refers probably to such estimates of population as were based upon a regular rate of increase from the presumed date of Adam and Eve and the birth of Cain, and to such guesses at truth in regard to national wealth and income as were pre-scientific. This is one of the very few topics upon which the disciples did not succeed in drawing from the Master any comments—the help which the trained economist can now derive from the trained statistician. But there is enough and to spare in this little book to delight the fit though few who are capable of appreciating it.

H. H.

6.—*New Survey of London Life and Labour. Vol. I. Forty Years of Change.* 8½" × 5½". xv + 438 pp. London: P. S. King, 1930. Price 17s. 6d.

It is forty-five years since Charles Booth set out upon his enquiry into London Life and Labour. In seventeen volumes, issued between 1889 and 1903, he recorded the results of this unique endeavour "to show the numerical relation which poverty, misery and depravity bear to regular earnings and comparative comfort, and to describe the general conditions under which each class lives." The lapse of time has brought so many changes that it is rarely that one can find in these volumes a reflection of present-day conditions; still less is it possible to draw inferences as to the direction of recent economic tendencies in London from an enquiry which admittedly only aimed at producing an instantaneous picture of conditions as they existed at a given time. "My principal aim," wrote Charles Booth, towards the end of his enquiry, "is still confined to the description of things as they are. I have not undertaken to investigate how they came to be so, nor except incidentally to indicate whither they are tending." His Survey obviously could not of itself furnish answers to the questions with which we are largely concerned to-day—"Is poverty diminishing or increasing? Are the conditions of life and labour in London becoming better or worse?" To answer these questions the New Survey of London Life and Labour was undertaken in 1928 by the London School of Economics and Political Science, which besides utilizing for the purpose part of the income from the Laura Spelman Rockefeller Foundation Memorial, received direct gifts for the furtherance of the Survey from the City Parochial Charities Trustees, the Carnegie United Kingdom Trustees, the Noel Buxton Trustees, the Halley Stewart Trustees, and the Fishmongers', Drapers', and Clothworkers' Companies.

With this necessarily brief outline of aims and origins, one can turn to this highly interesting introductory volume that forms the first of the new series—with which should be studied the paper read to the Society in 1929 by Sir H. Llewellyn-Smith, Director of the New Survey (Vol. XCII., IV., 1929). The book, after a general introduction, is divided into twelve main sections: Cost of Living; Wages, Hours of Labour and Earnings; House Rents and Over-crowding (by Sir H. Llewellyn-Smith and L. C. Marsh); Education (by Sir H. Llewellyn-Smith and M. I. Michaels); Public Amenities and Means of Recreation (by Sir H. Llewellyn-Smith and P. G. Nash); Area and Population; Occupations and Industries (by Professor Bowley); Travel and Mobility (by G. Ponsonby and S. K. Duck); Health (by Sir William Hamer); Unemployment and its Treatment (by Sir William Beveridge and L. C. Marsh); Poor Law Relief (by Sir Allan Powell and E. C. Blight); and Crime (by Sir Edward Troup). These studies are, naturally, based largely upon official and other published statistics, which are here admirably brought together and analysed. On the other hand, it must be remembered that in many ways the present volume must be regarded as preliminary to the special investigations which are being carried out and with which later volumes will deal. For instance, the census statistics show that

there has been a steady diminution of the influx into the County of London, the percentage of the London population who were born in other parts of the United Kingdom having decreased by nearly one-quarter in forty years. In the Booth Survey the social and economic character and effects of this influx of population were analysed at length, and a similar detailed analysis is now being made in connection with the present Survey. Again, in the Booth Survey a graphic account was given of the evils of casual labour at the London docks. In the present Survey there is being made an intensive study of the position of dock labour as compared with forty years ago, the results so far arrived at indicating that the prevalence of casual engagements in the Port of London has become a less important factor in London poverty than in Charles Booth's time.

A similar story of improvement in material well-being, in health and in culture runs throughout the book. The fact that the *average* workman in London can now buy a third more of articles of consumption in return for labour of an hour's less duration per day affords conclusive proof that the material conditions under which the mass of London workers live have considerably improved. Information at present available as to the relative advance of different sections of the population suggests that those living below Charles Booth's poverty line have shared equally in this improvement. This provisional conclusion receives strong support from the fact that the proportionate advance of "real" rates of wages since 1890 has been just about twice as great for unskilled as for skilled occupations, and that the rise in minimum rates of pay in the so-called "sweated" industries since they came under the Trade Boards Act, 1910, has been above rather than below the average rise for occupations generally.

Interesting sidelights are to be found in the changing proportions of income that are devoted to beer and tobacco. The *per capita* consumption of beer of "standard" strength in the London area has been reduced by about one-half, and it would appear that for every ten glasses of beer consumed in 1891 by the average Londoner, he drank in 1928 about six glasses of lighter beer. For this reduced quantity he had the privilege of paying rather more than half as much again. On the other hand, it would seem that the average money expenditure per head of the London population on tobacco must be well over four times as great as in 1890.

The discussion of amenities and means of recreation is important, since, roughly speaking, the average London worker has now an extra hour a day to himself as compared with the Booth survey. Bound up with this element is the question of transport, which by increasing the range of mobility of the London worker greatly alters the conditions of access to open spaces, outdoor recreation and cultural opportunities, and has, perhaps, even more important bearing on the conditions of housing and overcrowding. At the same time one must not neglect the "disamenities" of traffic dangers, noise and grime. The last "still presents one of the gravest of unsolved problems in relation to London amenities."

As regards health, the conclusion is drawn "that the great

success which has attended the organised efforts for the improvement of London health must be ascribed in large measure to the fact that during the last forty years the full effects of the Education Act of 1870 have been manifested in the emergence of a generation of parents who have themselves passed through the schools. A striking fall of infant and child mortality came about as soon as a generation which had passed through the primary schools had become parents of a new generation. Moreover, with the substitution of an educated for an illiterate community a public opinion has grown up which now supports instead of thwarting the efforts of the sanitary reformer."

Analysis of their vices suggests that the people of London have become much less inclined to acts of personal violence, are less addicted to drunkenness and are perhaps a little more honest, but that the standard of sexual morality is lower. The decline in number of burglaries is, at least in part, explicable by the use of the motor-car, which enables the London burglar readily to transfer the scene of his operations from London to the surrounding country.

Enough has been quoted to show the many differing problems with which this volume deals and the wide appeal that it is likely to make. In the introduction, stress is laid upon the fact that these various improvements in well-being have only been shown at present as improvements in *average* conditions. But "the progress of 'average' betterment is not, of itself, inconsistent with a growth of the poverty-stricken element of the population, side by side with a more than 'average' improvement in the conditions of the classes furthest removed from the poverty line." It is the Survey itself, with its intensive studies, which must show the differences between the various strata, and illuminate problems in which the "statistical measuring rod" fails us. This volume, apart from its own value, will make the reader await with added interest the "next instalment."

A. B. H.

7.—*Gold, Credit and Unemployment: Four Essays for Laymen.* By G. D. H. Cole. 7½" × 5"; 165 pp. London: George Allen and Unwin, Ltd. 1930. Price 5s. net.

When the present writer was very young there still lingered in the Scottish countryside the memory of an elementary reading-book, *Reading Made Easy*, familiarly and affectionately known as "The Reedymadaisy." To-day he is frequently asked by business men for "a short and easy book" on money. Alas, with a long shelf before his eyes, full of fat books on the history, theory, and practice of monetary theory, and with a painful memory of a recent struggle with Mr. Keynes's two mighty tomes, he is compelled to admit that there is not, and cannot be, any such book. "Finance without Tears" has still to be written. Nevertheless, Mr. Cole in his little book has made a gallant attempt to deal with not only one but two of the greatest problems of the day, and, though he professes not to be "either academic or exhaustive," such is the charm of the delightful, and deceptive, lucidity of his style that the wayfaring man may enter with him on a road in which he will sadly wander.

Admitting that he has simplified his arguments greatly, he

concludes that the gold standard is at present necessary, that our paper currency must be convertible into gold, and that it is essential to maintain stable rates of exchange, but that the volume of currency is "inelastic and irresponsive to internal needs." An increased fiduciary issue is no remedy, but he holds that "there is no need for any gold backing at all for any internal note issue." We can expand our issue of currency and credit up to the point where our price-level rises above the world price-level, when there would be a serious drain of gold. Improvements in production cause prices to fall, and there is a world tendency in this direction. A country which is progressing less quickly than others can only adjust its prices by repeated wage reductions, but this policy is "to begin the descent of a slippery slope into the abyss." Mr. Cole believes that we can "issue more currency and credit for the purpose of financing increased production and better production methods without causing our price-level to rise in relation to those of other countries, and gold to be drained away to such an extent as to threaten the effective convertibility of our paper-money for those who desire actual gold for export." But there are considerable difficulties, especially that, instead of financing production, the new credit might be used for speculation in securities and commodities with resultant rises in prices. Consequently, "we must control not only the amount of currency, and the amount of credit based upon it, but also the way in which these amounts are applied. This involves control, not only of the Bank of England, but also of the joint stock banks." "The amount of credit should be based, not on the volume of *past* production, but on the amount that *can be produced* under reasonable conditions with the productive resources available." "The ultimate source of production is demand, and, unless demand is increased, the effective supply of credit for production cannot be increased either." Therefore, "the Government must provide more employment in order to revive industry." A great scheme of public works—slum clearance, school-building, water supply, land development, canal and port development—should be taken in hand, and for this new credit will be required, otherwise employment will simply be diverted from one type of production to another. The unemployed being thus absorbed the purchasing power of their wages will stimulate demand and take up the new goods produced with the help of further credit.

In this summary Mr. Cole's plans and arguments have been submitted to an even greater "simplification" than that to which he has subjected monetary theory. Whether the business man who wishes to absorb knowledge without effort would be wise in trusting himself to Mr. Cole's guidance he may by now have begun to doubt, and even to think that he has been brought along the broad road that leadeth to destruction. Mr. Cole, at least, has no indecision as to his own goal: "In short, a 'managed' financial system involves also a national planning of productive effort. It means more and better figures about the course of industry and trade, far more publicity among business men about their productive plans and methods, and far more control over the course of production by the socialized banks as agents for the distribution of productive activity among

different industries and services. It also involves a control of the use of capital as well as credit : for to a great extent the supply of capital and credit must go together." Socialization of the banks is proposed as an immediate step on the way to complete socialization of industry. Banks, however, are primarily the custodians of deposits, that is, of private savings, and this socialization of private surpluses, their virtual appropriation, would seem rather to be the last than an early step in Mr. Cole's career. On this point his scheme would break down politically.

H. W. M.

8.—*British Banks and the Finance of Industry.* By S. Evelyn Thomas, B.Com. 8½" × 5½". vi + 290 pp. London: P. S. King. 1931. Price 12s. 6d.

Mr. Thomas in the central chapters of his book has given a clear picture of the relation of the British joint-stock banks to industry and agriculture, and of the differences between the English and Continental practice in this respect. He shows how the earlier development of industry in this country made it possible for industrialists to meet their own needs for capital, which were comparatively small at that stage, and left the banks free to concentrate primarily on deposit banking. To a great extent Mr. Thomas fills the rôle of apologist for the banks and maintains that they have given assistance, both to the large and small producer, more freely than their critics generally recognize. But though he defends them against the accusation of indifference to the needs of industry, and realizes that their methods were adequate to meet industrial demands in the past, he comes to the conclusion that in the face of the present difficulties the banks must give greater attention to the interests of the borrower. He advocates that the banks should keep in closer touch with industry both through improved research departments and by a greater degree of representation on industrial boards on the lines of the German system.

There are various points in Mr. Thomas's survey which are open to question, but what matters more than the reader's agreement, or otherwise, with his conclusions is his method of handling his evidence. He is somewhat too inclined to settle controversial points merely by quoting the views of authorities on the special question. Thus, to take one example, he states categorically that industrialists can borrow more cheaply in this country than abroad, and rounds this statement off by a paragraph to the same effect from an article by Dr. Gregory. He does not, however, give the figures on which Dr. Gregory bases his conclusions, and without these, or any other data to take their place, the statement remains non-proven from the reader's point of view, however reliable the authority.

The book, altogether, conveys the general impression that Mr. Thomas is more in his element in collecting facts and describing the actual situation than in handling controversial subjects, in connection with which he is apt to display a certain looseness and superficiality of thought. Thus, dealing with the causes of the agricultural depression, he states it was apparent from the outset that though farmers were feeling very severely the effect of foreign

competition and other factors, "their main difficulties were due to the inadequacy of credit supplies." Considering that even countries in which agricultural credit is highly developed have also been passing through a period of extreme agricultural depression—a fact which Mr. Thomas completely ignores—this statement obviously requires either modification or further explanation. Again, after describing the aims of the United Dominions Trust and its attempts to foster hire purchase for trading purposes, he suddenly switches on to the development of the hire-purchase system in connection with the sale of motor-cars, which is a very different matter, and follows this up with the statement that "there is clearly no reason why the principle of hire purchase should not be greatly extended with most beneficial results to our present industrial and commercial position." Since many observers consider the excessive development of the hire-purchase system was one of the contributory causes of the American collapse, this point either needs further elaboration or else should not have been introduced at all.

This lack of judgment as to what points need fuller treatment and what could be altogether omitted runs throughout the book. Mr. Thomas has unfortunately not limited himself to topics directly suggested by the title of the book, but has attempted to give far too general a discussion of the causes of the present industrial depression. In Chapter VIII, on "The Government and the Industrial Situation," he deals, *inter alia*, with such topics as Safeguarding, the Denrating Act, the Burden of Taxation, and "the Tragedy of the Dole." A couple of pages giving Mr. Thomas's views, unsupported by facts or figures, on Safeguarding, a page on Unemployment Insurance and the creation of "a mass of inefficient and sadly degenerate people who prefer their easily won leisure to the sterner calls of hard work," and other sections on topical matters, read like competently written leading articles in the daily press. Such material is entirely out of place in a serious study of banking methods. To a certain extent this applies also to the second chapter, on "Our General Monetary Policy and its Control." Such questions as the pros and cons of a managed currency and the advisability of the return to the gold standard are not essential to the main thesis of the book, and are too intricate for such summary handling as they receive here. No one with the slightest knowledge of the subject will find anything illuminating in their treatment, whilst the complete tyro would find the information too scanty to enable him to reach any conclusion convincing to himself.

In spite of these drawbacks, however, the bulk of the book will be found useful by those who want a general description of the part played by the banks in the industrial and agricultural life of the country, though there is little original light shed on the problems involved.

W. A. E.

9.—*Britain and World Trade: Quo Vadimus and other Economic Essays.* By A. Loveday. 8½" × 5½". xxi + 229 pp. London: Longmans, Green & Co. 1931. Price 10s. 6d.

Mr. Loveday's survey of post-war economic trends is a work of

considerable importance, since it has the authority of one who occupies a specially favourable position for undertaking such a task. And while the essays of which this book is composed deal broadly with world conditions, they have a special interest for British readers, since they are focussed on an examination of the position of Britain in world trade as it is to-day.

Mr. Loveday begins by examining the developments that occurred during the post-war years down to 1925. There was in this period an increase in the total of world trade, though European progress lagged behind that of any other continent. The period is also marked by changes in distribution and production, outstanding examples being the multiplication in the use of rubber, petroleum, vegetable fats, and wood pulp, though this progress was off-set by a limitation of demand for the staple materials of pre-war trade, coal, cotton, and steel. So far as Europe was concerned, industrial output as a whole was nearly as great as before the war, but it was differently distributed both as to trades and to countries. Within Europe, France, Sweden, and Finland gained more than the average, while the United Kingdom, Germany, and Russia fell back. Outside Europe, competitive industries in many directions continued their war-time expansion, and still further supplanted European production. Particularly in the United Kingdom much productive capacity became surplus to requirements, while the newer industries failed to compensate for the supersession of the old. Old capital equipment was redundant, new capital deficient.

The years 1925-29, the second period considered, showed markedly different characteristics. There was a rapid and widespread increase in wealth, Eastern Europe in particular making great strides in production, while Europe as a whole progressed at a rate only equalled by South America. Trade was expanding even faster than production, and Europe, though not England, began to regain distant markets. In this period progress was more marked in industry than in agriculture. Europe, which up to 1925 was producing 20 per cent. less pig iron and 5 per cent. less steel than before the war, increased her output by 38 and 42 per cent. respectively. Coal-mining, on the other hand, was stagnant, the cotton trade unprogressive, and in Europe as a whole agriculture was unable to meet the challenge arising from mechanization and new methods elsewhere applied. The broad indications are that the growth of production and exchange of wealth were exceptionally rapid during this period.

In his chapter "*Quo Vadimus*" Mr. Loveday reviews the significant tendencies of this economic development. In the post-war world, with the growth of wealth a radical change in the character of demand has become evident, away from prime necessities of life towards goods and services satisfying secondary needs, the demand for which displays greater elasticity. Thus the production of food-stuffs in 1927 was only 12 per cent. greater than in 1913, while raw material production was up by 43 per cent., implying a rapid development of industry in new directions. As a result, the conception of comfort is changing and individual taste has a fuller scope. Trade



barriers, Mr. Loveday foresees, must in these circumstances become increasingly irksome, and the demand for interchange of commodities must gain strength. On the other hand, the growing instability and mobility of secondary demand raises new impediments to smooth development. Competition between firm and firm tends to pass into competition between industry and industry, as one product is substituted for a rival product. Combination for marketing becomes essential, and the producer is forced to seek alleviation for disastrous competition in control of output, price, and market, and in mergers, cartels, and understandings. Advertising and publicity acquire new significance and assume gigantic proportions.

The essay which gives its title to the book is already familiar to many readers through its appearance in the *Economist*.\* It is thus only necessary to say that this pivotal contribution to the discussion marshals and examines the whole chain of statistical indices which illustrate the trend of British trade relatively to that of other countries, and thus confronts the reader with a cumulative weight of evidence on the progressive loss of her former position. Mr. Loveday shows that while the trade of the world has increased, the share of the United Kingdom has decreased, and is decreasing. "If the share of the United Kingdom in world imports to-day were the same as in 1913 it would be between £160 and £170 million greater than it is." She has fallen behind in the race, and as one group of industries after another is examined the same phenomenon presents itself. Taking a dozen staple products, Mr. Loveday finds that in every case save one the British share of European production was less in 1928 than in either 1923 or 1924.

In explanation of this decline of competing power, a number of causes have been suggested which Mr. Loveday rejects. The decline is not accounted for by European unsettlement causing demand to weaken, nor can it be attributed to collapsed exchanges. The United Kingdom has lost ground to the great and the small, to the financially pure and the financially reprobate. Moreover, the losses due to reduced demand for the products of the older staple industries have not been made good by the progress of newer industries; for the progress made by the newer and more prosperous trades in Britain has been hardly less disappointing in comparison with their enormous growth in competing countries. Mr. Loveday finds this relatively slow progress even more significant than the depression of the depressed staple industries. As the D'Abernon Mission saw the situation in South America, "in new departments of trade we have been completely outdistanced"; in aviation, road construction, motor transport and many another modern industry, others have taken the place which might have been ours. The root cause is found in lack of adaptability to the changed conditions, and in high costs of production resulting from the undue rigidity of industrial structure. These characteristic defects have become a fatal handicap to effective competition in the new circumstances. The real problem, therefore, is that of restoring elasticity to the whole organism of British trade. The country has no alternative; for she

\* Monthly Supplement, October 25, 1930.

is dependent not merely for her prosperity but for her existence on the sales of her manufactures abroad.

Such is Mr. Loveday's thesis; and the statement will surely be taken as a challenge, not accepted as a dirge. Is there any effective reply, any possibility of disproof? Alas, no! In the main the facts cannot be gainsaid though the book contains several provocative generalizations which seem to call for fuller material justification before they can be accepted. A few minor and major points may be mentioned here. In his table on p. 150, for example, showing the proportion of post-war imports into Europe obtained from the United Kingdom, Mr. Loveday appears to have included trade with the Irish Free State, and thus understated the decline. Again, there are some passages in which the comparison of indices of increase incurs risk of drawing distorted conclusions as to the relative volumes involved. A comment on the presentation of the story is also called for. It is a scattered kind of book, and the omission to provide an index is the more regrettable. But the regret which all readers will feel is that Mr. Loveday was unable to face the task of rewriting and digesting the various essays of which the volume is composed. He has thus thrown on his readers a burden which they have an equal right to evade, and unfortunately the story loses appreciably by repetition and lack of condensation. For this reason those who are interested in essentials will be well advised to omit the first chapter on first reading, as well as the essays on Gold and Prices and Tariff Level Indices, which are ancillary to the main discussion.

When weighing the justice of the criticisms which are made against British industry, many will feel that too little recognition has been given to the special handicap under which this country has to contend in the matter of finance. Surely the questions of finance, taxation, and the supply of capital are of primary importance in estimating shortcomings and possibilities in the economic field, and no statement of the position can be complete which does not fully recognize this fact.

Finally, a word must be given to the recurring thesis which is emphasized by Mr. Loveday as "the central fact and paradox of economic life to-day"; namely, the accompaniment of a growing instability of demand by a growing rigidity in the mechanism of supply. However interesting as a fact of observation under particular conditions of world trade, this seems a perilous assumption when thus generalized. The demand for variety, is, of course, an important limiting factor in the development of mass production technique. But it may be doubted whether there are valid reasons for regarding it either as novel or as differing in kind from that obtaining since the very birth of the factory system. Nor, on the other hand, is it easy to rely on it in practice as setting definite bounds to mass production. Has not Mr. Henry Ford twice demonstrated the opposite? Has not Japan shown that it can be applied to cotton textiles with a success never dreamed of in Lancashire? Is not the whole lesson of what America calls "simplified practice" the same? Finally, is not this the lesson that Britain has been slow to learn, and is it not just as important as the need for adaptability?

Mr. Loveday has brought his story down to the beginning of the general collapse of world trade in 1930. We shall eagerly await his next contribution examining the relative changes between country and country which the great depression brings to light, and we shall look with almost painful interest for his assessment of the position of the United Kingdom under this new strain.

G. I. H. LL.

10.—*American Industry and Commerce*. By Edward Dana Durand. 8" x 5½". xviii + 653 pp. Boston, U.S.A., and London: Ginn and Company, Ltd. Price 17s. 6d. net.

Mr. Durand is one of the foremost statisticians in America. He is Statistical Assistant to the United States Secretary of Commerce and has been Director of the United States Bureau of the Census. Any work from his pen commands a respectful attention, and he has now written a book which should have a wide circulation, not only in the United States but among all who are interested in that great country and its economic growth. The aim of the author has been to give a general picture, not overloaded by detail, of industry and commerce of the United States. The statistical information is presented for the most part in diagrammatic form, but in the majority of cases the significant figures are shown alongside the bars of the diagram. The value of the work is enhanced by the introduction of comparative figures for other countries.

Some general particulars are given relating to various periods in the nineteenth century, but, as stated in the Preface, the "trends since the beginning of the present century are discussed with greater fullness; they are the more significant because the forces at work are largely of a continuing character, so that economic movements for some time to come are likely to be in the same direction."

The first of the twelve chapters into which the book is divided deals with income and standards of living. This is followed by a chapter on the economic progress of the United States, and the next three discuss the primary and secondary factors in that progress. Chapter VI is devoted to occupations of the people, and Chapter VII to the general economic geography of the country. Then follow three chapters each dealing with a big group of industries, viz. agriculture and food-stuffs, mining and quarrying and related manufacturing industries, and other manufactures. The last two chapters are concerned with transportation and communications, and foreign trade, respectively. The chapter headings, however, give an inadequate idea of the ground covered, but considerations of space preclude the quotation of the various sections into which each chapter is divided. The chapter on foreign trade, for example, consists of eleven sections dealing with various aspects of trade between the United States and other countries and ends with a section headed "The Future of American Trade." As regards this future, Mr. Durand expresses the opinion that "Unless untoward events occur at home or abroad there is likely to be no sudden change in the relative importance or the economic character of the trade with foreign countries. Should the forces at present operating continue, the volume will continue to grow

apace, parallel with further advance in domestic production. Exports will be more and more of manufactured goods."

Mr. Durand marshals his facts in such good order and his style is so graceful that every page is a pleasure to read. He displays a natural pride in the achievements of his countrymen, but he is no "booster." His general attitude is well illustrated by the following extract from his Introduction: "The richer a nation the more its economy merits analysis. The wealth of the United States is bound to have an immense influence, for good or for ill, on the future of its own people and of the whole world. It thus demands the interest of the historian, the philanthropist, and the philosopher, as well as that of the economist, the statesman, and the man of affairs. The economic analyst, however, is under no obligation himself to discuss the bearings of the material things he describes upon the spiritual side of life. That side . . . is not a realm of demonstrable facts, of cold statistics, but of impression and opinion. The economist may well be content to furnish the background for the broader but less precise study of the sociologist, the æsthetic critic and the moralist."

The background provided by Mr. Durand is very complete and his volume supplies an important text-book for the student as well as a rich mine of information for the general reader.

In a summary of the factors in American progress and prosperity which first sets out the primary factors, viz. the character of the people and of the country (rich and varied resources, etc.), it is stated that "Among the many secondary factors in the well-being and progress of the United States, perhaps the following stand out most conspicuously:

The high standards and wide spread of education and of scientific research.

The position and attitude of the wage-earners; their high wages, their relative contentment, and their favourable disposition toward methods that make for large production.

The large use of machinery and other forms of capital.

The large use of mechanical power, and especially of power applied through the intermediary of the electric current.

The bigscale on which most business operations are conducted.

The mass production of standardized articles.

The systematization of business: the scientific study of methods, the careful calculation of costs, the organized conduct of research, the co-operation among business men to common ends.

The freedom of individual initiative, combined with a disposition of individuals to work together in great, but usually privately owned, enterprises."

Mr. Durand is hopeful regarding the spread of education among the people of the United States, and is of opinion that, as compared with most other countries, they occupy a higher cultural position. "As judged by ideal standards their taste may be low; as judged by comparison with what is found elsewhere it is at least reasonably high. The common people possess in exceptional measure both the means to afford and the education to enjoy things which appeal to the

aesthetic sense. Some of what they hear and see and read is of good quality, and a great deal of it is better than nothing at all. . . . Beyond question the taste of the common man and the common woman in America has steadily risen; with the ever more abundant and more advanced education furnished them it is bound to advance still further.”

J. W. V.

11.—*How to Compete with Foreign Cloth.* By M. P. Gandhi, M.A. 10" x 6". 117 pp. Calcutta: G. N. Mitra of the Book Company, Ltd., 1931. Price 8s.

This book will be gloomy reading for Lancashire. The author tells us that the proof-sheets have been read by Mahatma Gandhi and that several valuable suggestions made by him have been embodied in the book, the title of which was suggested by the Mahatma. A preface by Sir P. C. Ray explains in a few words how the problem suggested by the title is to be solved: "I also trust that the Nationalist Government will encourage handloom weaving in the manner which he has suggested and which has met with the approval of Mahatmaji, viz. that there should be a prohibitive tariff duty on imports of foreign cloth, and that the Indian mills should be precluded from engaging themselves in the production of certain kinds of cloth which will be the speciality of handlooms."

It is also stated that Mahatma Gandhi is opposed to the importation of artificial silk yarn and cloth, but personally he is not adverse to necessary importations of American and Egyptian raw cotton, a question on which there is at present much controversy in Nationalist circles in India. India is said to have about two million handlooms which produce about one-quarter of the total quantity of cotton goods consumed in the country, but only about one yard in six is woven from hand-spun yarn, and it is the Mahatma's policy to increase hand-spinning until sufficient can be spun by hand to supply all the handlooms which use coarse counts.

It is quite clear that the author is under no illusion, but that he recognizes that this policy must involve sacrifice on the part of the consumer in India; he says, *e.g.*, "even if the price of handloom cloth is a little higher than the mill-made cloth, etc."; and again, "Nay, it is the bounden duty of the people to use cloth manufactured in India even at a sacrifice of taste, convenience and money."

Mr. M. P. Gandhi maintains that hand-weaving and hand-spinning must stand or fall together, and states that every patriotic Indian now recognizes that it is his duty "to spin yarn either on the charkha or on the takli for at least half an hour a day; some indeed have taken to it more kindly and are spinning regularly for a longer time." A charkha is a spinning-wheel and a takli is a little pocket instrument worked by the thumb and forefinger.

It is difficult to believe that, once the present intensive propaganda declines, a great hand-spinning industry can be built up on so slender a foundation in competition with large and powerful local spinning-mills.

One is left with an uneasy feeling that in the long run it is the mill-owners who will benefit and the people who will suffer. B. E.

12.—*Population Problem of India with special reference to Food Supply.* By B. T. Ranadive, M.A.  $8\frac{1}{2}'' \times 5\frac{1}{2}''$ . xviii + 211 pp. Calcutta: Longmans. 1930. 10s. 6d.

Although the conclusions reached by the author give little hope of solving the economic problems of India's population, the book has a distinct merit in that it concisely presents the problems to be solved and discusses several possible solutions.

The opening chapter is devoted to a brief account of the Malthusian doctrine and the several objections on which the critics rely are examined. The author holds that these objections arise from a misunderstanding of Malthus' principles and that "whatever the structure of society, the Principle of Population will be sure to operate." In discussing the checks on the European population since ancient times, a distinction is drawn between the preventive checks such as celibacy and postponement of marriage and the positive checks of war, disease, and famine. Whereas the latter were more important in early times, deliberate prevention is to-day the strongest factor in limiting numbers. Thus, it is asserted, the population of Europe has enjoyed a steadily increasing standard of living.

Famine and epidemics have played the largest part in limiting India's population, although it still increases at a more rapid pace than production, causing a consistent decline in general welfare. After considering the factors affecting India's food supply, the conclusion is reached that the total crop yields have lagged behind the increase in the area cultivated. If an economic holding is one of 25 acres, 88 per cent. of the holdings, comprising 48 per cent. of the total cultivated area, are uneconomic, and these proportions, moreover, are steadily increasing. It is considered unlikely that the agricultural surplus population can expect relief from the industrialization of India, since, to be of any help, industrial progress must proceed much more quickly than it has in England or Germany. Having dismissed such remedies as later marriage and abstinence during marriage, the policy of contraception is discussed over several pages, and, on account of the social tradition which demands a son in every family, this possibility is also dismissed in spite of the fact that "history has provided no better alternative to escape the rigours of the Malthusian principle."

The book is very readable and presents a skilful, although light, sketch of the problem. The reader, however, may be reluctant to believe that India is without hope in attempting to solve her population difficulties.

R. F. G.

13.—*Transport Co-ordination: a Study of Present-day Transport Problems.* By K. G. Fenelon, M.A., Ph.D.  $8\frac{1}{2}'' \times 5\frac{1}{2}''$ . 142 pp. London: P. S. King, 1931. 6s.

Transport questions are especially interesting at the present time in view of the financial straits of the railway companies, the congestion of urban street traffic, and the enormous expenditure on roads. Dr. Fenelon's book naturally challenges comparison with the final report of the Royal Commission on Transport. He has a higher opinion of trams than the Commission, pointing out that they pay

rates on their track in addition to maintaining it. He agrees in thinking the amalgamation of canals desirable, but explains that canal traffic has declined (Manchester Ship Canal excepted) more than a half since 1906.

A large part of his book is devoted to the contest between railways and road vehicles. The lorry competes with the train most keenly in high classification goods, its charges being based on "cost of service," whereas railways spread the cost over all assumed traffic on the basis of ability to pay, so their whole economic position has been undermined by the loss of the highly-paying classes. Road vehicles have many advantages over trains and trams, especially in their door-to-door service, although here the railways have made great efforts, partly by the use of containers but more by running their own road vehicles as auxiliaries. Road vehicles, too, have an economic advantage where traffic is too light to support a railway. Dr. Fenelon gives statistics showing the loss of passenger traffic. This is due partly to lower fares, for the bus can charge *1d.* per mile as against the ordinary railway fare of *1½d.*, but now railways give so many special fares that their average charge in 1927 was *·86d.* Parcels, newspapers, and fish traffic by rail, on the contrary, have shown a continuous increase.

The Railways Act of 1921 was expected to secure to the railway companies a "standard revenue," *i.e.* the net receipts of the year 1913. If receipts exceeded that standard, the companies were to reduce their charges, if they fell below it they might raise their rates and fares. Unhappily, to-day, the companies are faced with the dilemma that if they raise their rates they will lose traffic. Wages are 140 per cent. higher than they were in 1913, and actual earnings are, or were, even greater. In 1913 wages took 37 per cent. of the total receipts, in 1924 they took 56 per cent. The troubles of the railways are due partly to the trade depression, partly to road competition, and Dr. Fenelon, asking whether road competition is fair, points out that the capital costs of road construction have been borne by the public, and that heavy commercial vehicles do not pay enough towards the wear and tear which they cause. Further, road vehicles are free from three liabilities which Parliament has imposed on the railway companies; they are not "common carriers," they are free from the "undue preference" rule, they can pick and choose their traffic.

Competition has not solved the transport problem; it involves waste and overlapping, and "unrestricted competition, especially between road and rail transport, is not in the best interests of the public." Dr. Fenelon considers various forms of co-operation, and prefers the voluntary form. Of course, there are difficulties: on one side there is the risk of monopoly, on the other side "pirates" may skim the cream off traffics. Many interesting details are given of actual amalgamation between railways and omnibus concerns. There is a real co-ordination of railways and road vehicles (municipal included) for passengers over a large part of England, and, though less has been done for goods traffic, there is now a good service of motor lorries in rural districts. Railhead delivery has been developed

recently, under the lead of the London, Midland and Scottish Railway, goods are taken in bulk from factory to railhead by express freight train, and then broken up into consignments. Dr. Fenelon has a lively belief in containers. not really a new idea, though at present their use is restricted by the need of cranes.

In other countries there is the same competition between road and rail, but where the Government owns the railways it takes care that the competition shall not be unrestricted. In Italy the Government does not permit competition; in Australia the State Governments have tried to protect their railways by severe regulations and high licence duties. In South Africa road competition is severe, and road vehicles operate mainly in areas already served by railways, not in the rural areas. Problems are more complex in the United States, where the separate States legislate within their boundaries, so that the law differs from State to State, but as a rule the road vehicle has the liabilities of a common carrier, and may require a "certificate of public convenience and necessity" from the State Government, and a municipal licence as well. The great railroads run their own road vehicles, and also use them in place of abandoned branch lines. They have given up differential charges for container traffic.

In big towns the problem is a special one—congestion. The competition of railway, omnibus, and tram may be ruinous to all, without being of service to the public. Thus, as Dr. Fenelon says (p. 118), the extension of underground railways in London is an urgent necessity, but is not likely to be made while unrestricted surface competition continues. Perhaps co-ordination is especially difficult in London because of the many interests concerned; it has been carried further in Paris and Berlin. Mr. Morrison's London Traffic Bill is an attempt to answer the questions asked by Dr. Fenelon. J. E. A.

14.—*History of the Financial Administration of Ireland to 1817.* By T. J. Kiernan, Ph.D. (Lond.). 8½" × 5½". xi + 360 pp. London: P. S. King & Son, 1930. 15s. net.

The story of the relations between Great Britain and Ireland has ceased to have the poignant interest which it used to have for British readers, but this volume (Number 105 of the monographs by lecturers and students connected with the London School of Economics and Political Science, and written by a Fellow of the Royal Statistical Society), which deals with one of the less familiar aspects of the question, will well repay reading. The native Irish had no part in the administration of their country, and the powers of the Parliament of the Protestant adventurers who had settled in part of the country were limited from 1494 to 1782 by Poynings' Act, giving the English Privy Council the right to determine when Irish Parliaments should meet, and prescribing that "prospective legislation had to be submitted by the executive power in Ireland to the King and the English Privy Council; and, consequentially, parliament was prevented from conceiving legislation and could only pass or reject the bills which had been approved of by the Lord Lieutenant and the Irish Privy Council and by the King and the English Privy Council." This Act was long valued by the Irish



Parliament as a defence against a tyrannical and disloyal Lord Lieutenant or Lord Deputy. Strafford was the first to see its value to a despotic English king. Nevertheless, "under Poyning's legislation there was always left scope for the parliament to suggest proposals or drafts or heads for the approval of the Irish Council and transmission by them to England." Financial control, that great weapon of parliaments, was signed away by the Irish legislature in 1662, when in return for the grants of lands forfeited during the Civil War the interested parties granted to the Crown in perpetuity customs and excise duties, hearth tax, &c. This hereditary revenue amounted to more than two-thirds of the total revenue and was well described by Grattan as "that original sin of your ancestors, which visits you from generation to generation." The second great betrayal was when in 1692 the Irish Parliament acquiesced in the assertion by the English Parliament of the right to legislate for Ireland in matters affecting trade, and thus on the precedent of the forfeiture Acts of Charles II's reign the Irish woollen industry was destroyed. Dr. Kiernan describes in considerable detail the attempts to exercise some parliamentary control over finance by appropriation of supply and audit of accounts, and, while the history, not being "statistical," is outside the usual scope of this *Journal*, it will be of considerable interest to connoisseurs of finance. The attempts to encourage industry in the eighteenth century, at a time when the country was bare of capital, were numerous, as a list of 67 Acts passed between 1707 and 1799, principally for the improvement of tillage and the linen and hemp industries, shows. Grants were often given to individuals, and "the experience of the Irish Parliament in the last ten years of its existence," says Dr. Kiernan, "gives strong support to the rule that financial applications should not be entertained from non-ministerial members of parliament." A comprehensive bibliography is appended to the book.

H. W. M.

## 15.—Other New Publications.\*

Clarke (J. J.). *The Local Government of the United Kingdom*. 6th ed. 7½" × 4½". xv + 820 pp. London: Pitman, 1931. Price 12s. 6d.

[The fifth edition of this book was noticed in the *Journal* for 1930 (p. 139). In the present one the author has added a section on Transport, which includes a chapter on the Road Traffic Act, 1930; the chapter on Housing has been rewritten in view of the changes effected by the Housing Act of 1930, and the section on Public Assistance has been remodelled to conform with the Local Government Act, 1929, and the Poor Law Act, 1930.]

Eaton (Allen) and Harrison (Shelby M.). *A Bibliography of Social Surveys: Reports of Fact-finding Studies made as a Basis for Social Action; arranged by subjects and localities. Reports to January 1, 1928*. 9" × 5½". xcvi + 467 pp. New York: Russell Sage Foundation, 1930. Price \$3.50.

[The earliest comprehensive survey undertaken in the United States was the Pittsburgh Survey of 1907, the promoters of which took advan-

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\* See also "Additions to Library," pp. 479 *et seq.*

tage of the example set by Charles Booth in the London Survey. The present volume embodies a classified list of 2,775 titles of general and special surveys which had been completed up to January, 1928, and a supplementary list of nearly 100 which were begun between that date and that of the book's publication. Part I of the bibliography covers Part I of the Social Survey; Part II, Surveys in Specialized Fields, grouped under 125 subject headings. These last are mainly investigations of a narrowly special nature, and the subjects range over a wide and varied field, including, for example, Mental Defectives in Virginia, a Study of Fire Risks in a Business Section of Boston, Food Supply in Families of Limited Means, and Proposed Consolidations of Fire Police Alarm Telegraph Systems. Part III gives publications on the purposes and methods of surveys; Part IV is a geographical index. The publications are, naturally, almost all concerned with localities in the United States, and to have them all enumerated in a classified bibliography should be an immense boon to social and sociological workers and students, especially as the publisher, the number of pages, and the price of each are given. An introduction dealing with the purposes, history and utility of such surveys is contributed by Mr. Harrison, and adds to the value of the work.]

*Gilson (Mary B.) and Riches (E. J.). Employers' Additional Unemployment Benefit Schemes in Great Britain. 9½" × 6½". 47 pp. Geneva, 1930. Price 1s.*

[A short account of the scope and working of fifteen schemes of unemployment benefit designed by particular employers to meet requirements not covered by National Insurance. The schemes, which differ widely in their working, are of three kinds: (a) Joint Trade Union and Employers' Schemes, (b) Employers' Schemes, and (c) Employment Guarantee Schemes, and a comparison is given of their financial organization; methods of administration, etc.]

*A London Bibliography of the Social Sciences. Being the subject catalogue of the British Library of Political and Economic Science at the School of Economics, the Goldsmiths' Library of Economic Literature at the University of London, the Libraries of the Royal Statistical Society and the Royal Anthropological Society, and certain special collections at the University College, London, and elsewhere. Compiled under the direction of B. M. Headicar and C. Fuller, with an introduction by Sidney Webb. 10" × 7½". Vols. I and II. London: London School of Economics, 1931.*

[This work is valuable, in the first place, as a subject catalogue of the British Library of Political and Economic Science, the largest library devoted to the social sciences; secondly, as the first attempt to compile a reasonably complete bibliography of the social sciences, and thirdly, as a combined catalogue of the more important collections of literature on the social sciences existing in London.

The work will be completed in four volumes, of which two have already been issued. In the first three volumes the arrangement is by subjects and in alphabetical order, and the fourth volume will consist of an alphabetical index to the names of the authors. The compilation has been undertaken by a special cataloguing staff under the direction of the Librarian and Assistant Librarian of the London School of Economics, and the work has been made financially possible by the joint help of the Laura Spelman Rockefeller Memorial and the Carnegie United Kingdom Trustees.]

*Milbank Memorial Fund. Twenty-fifth anniversary, 1930. 10½" × 7½". 75 pp. New York, 1930.*

[The Milbank Memorial Fund for the improvement of "the physical, mental and moral condition of humanity" was founded in 1905 by

Mrs. Elizabeth Milbank Anderson, a friend of the higher education of women, and an active worker in the interests of the poor. Since its foundation the Fund has given grants to 131 different social and health organizations. One of these enabled the New York Association for Improving the Conditions of the Poor to open its Department of Social Welfare, and another provided the means of establishing the Trudeau Foundation for tuberculosis work and research. Other organizations benefiting by the Fund include the Children's Aid Society, the Legal Aid Society, the Henry Street Nursing Settlement, the New York Health Demonstration, and the National Committee for Mental Hygiene. This book contains a record of the work of the Fund and of the proceedings commemorating its twenty-fifth anniversary.]

*Miller (Andrew)*. Practical Cost Accounts applicable to various Industries, with 30 forms and graphs.  $8\frac{1}{4}" \times 5\frac{1}{2}"$ . 97 pp. London: Gee & Co., 1931. Price 8s. 6d.

[The author's earlier book, *Technical Costs and Estimates*, published in 1924, was briefly noticed in the *Journal* for July of that year. The present work, to which Lord Weir contributes a foreword, covers a larger field, and among the special aspects treated are campaigning against waste, costs of materials, labour costs, labour payment by results, on-cost accounts, on-cost allotment, departmental or process costs, job or order costs, and costs and finance accounts. The book is indexed, and the 30 forms and graphs are attached to the cover of the book in such a way that they may be opened out and compared with any part of the text.]

Russell Sage Foundation. Social Work Year Book, 1929.  $9\frac{1}{2}" \times 8\frac{1}{2}"$ . 600 pp. New York, 1930. Price \$4.

[This is in effect an encyclopædia dealing with social work in the widest sense of the word. The articles, which number over 200 and average about 2½ pages in length, are arranged alphabetically, while their titles are classified into subject groups in a preliminary list. The main groups are twelve in number:—Families and Adults, Children, the Handicapped, Miscellaneous Classes, Mental Hygiene, Health, Industry, Crime and Penal Conditions, Recreation and Related Activities, Community Organization, Church Social Work, and Miscellaneous. This last includes articles on Social Surveys, City and Regional Planning, Adult Education, Statistics of Social Work, etc. The second and much shorter part of the volume consists of a description of National Agencies for Social Work, in alphabetical order, and a classified index of these organizations.]

*Stoke (Harold W.)*. The Foreign Relations of the Federal State.  $8\frac{1}{4}" \times 5\frac{1}{2}"$ . vii + 245 pp. Baltimore: Johns Hopkins Press. London: H. Milford, 1931. Price \$2.25.

[The purpose of this study is, in the author's words, "to reveal the peculiarities of the federal state in international relations." The constitutions of nine federal governments are examined, the chief attention being given, not unnaturally, to that of the United States, on account of its extent, preponderance, and length of experience.

After examining the constitutional nature of the federal state and the machinery of the control of foreign relations, the author reviews the position of federal governments and of member-states with respect to international law, treaty-making powers, and international obligations; while the last two chapters deal with the influence of the member-states upon the foreign policies of federal states, and the practical force of federalism in international relations. A bibliography and a satisfactorily full index are appended.]

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## CURRENT NOTES.

The monthly totals of Imports and Exports continue to wear a disheartening appearance, if compared with the corresponding figures of a year and two years ago. For the last four months, import totals have been, roughly, 25 per cent. below those of last year and 30 per cent. below those of 1929, while exports of United Kingdom goods have been about one-third less than last year in value and 45 per cent. less than in 1929. The differences in prices for like commodities have been such as to account for the major part of the fall in imports, as the average prices of imports have been nearly 20 per cent. lower than a year ago. In the case of exports, however, the fall in prices has not, in this period, amounted to more than about 10 per cent., so that the apparent significance of the figures is not largely modified by taking account of price changes. As compared with last year, imports—both in the total and after deduction of re-exports—have decreased by only about 6 per cent. in quantity, while exports have been reduced in quantity by about 25 per cent., except in so far as this conclusion may be modified by considerations affecting the quality of the goods exported. When competition of native manufacturers limits our markets abroad, it happens frequently that the lower grades of goods are those first affected. Thus the apparent fall in average values of a given class of exports does not fully express the fall in value of the goods which continue to hold the market, and the decrease in quantity, calculated from the results of valuing current exports at the average value of goods similarly described in a past period, exaggerates, so far as this consideration is important, the actual falling off.

Our usual comparison of the aggregates for the latest twelve months with the corresponding figures for a year earlier is shown on the following page. It will be seen that, in comparing these two periods, imports show a reduction in money value of somewhat less than 20 per cent., and British exports a reduction of about 30 per cent., re-exports being reduced in value by about 25 per cent. The principal reductions in imports were in the class of Raw Materials, the value falling away by just under one-third of its amount, and the

Movements and Classes.	Twelve Months ending May, 1930.	Twelve Months ending May, 1931.	Increase (+) or Decrease (—).			
<b>Imports, c.i.f.—</b>	£'000.	£'000.	£'000.			
Food, drink, and tobacco	513,546	443,560	— 69,986			
Raw materials and articles mainly un- manufactured	306,829	205,044	— 101,785			
Articles wholly or mainly manufac- tured ...	333,111	276,471	— 56,640			
Other articles ...	12,248	10,751	— 1,497			
<b>Total Imports ...</b>	<b>1,165,734</b>	<b>935,826</b>	<b>— 229,908</b>			
<b>Exports, f.o.b.—</b>						
<i>United Kingdom Produce and Manufactures—</i>						
Food, drink, and tobacco	53,784	43,655	— 10,129			
Raw materials and articles mainly un- manufactured	75,421	53,701	— 21,720			
Articles wholly or mainly manufac- tured ...	532,971	363,606	— 169,365			
Other articles ...	20,330	17,309	— 3,021			
<i>Imported Merchandise—</i>						
Food, drink, and tobacco	25,261	22,274	— 2,987			
Raw materials and articles mainly un- manufactured	45,484	31,606	— 13,878			
Articles wholly or mainly manufac- tured ...	28,914	20,737	— 8,177			
Other articles ...	498	627	+ 129			
<b>Total Exports ...</b>	<b>782,663</b>	<b>553,515</b>	<b>— 229,148</b>			
<b>Bullion and Specie—</b>						
Imports ...	96,073	79,405	— 16,668			
Exports ...	103,353	85,960	— 17,393			
<b>Movements of Shipping in the Foreign Trade—</b>	<b>Number of Vessels.</b>	<b>Thousand Net Tons.</b>	<b>Number of Vessels.</b>	<b>Thousand Net Tons.</b>	<b>Number of Vessels.</b>	<b>Thousand Net Tons.</b>
<i>Entered with cargoes—</i>						
British ...	31,953	41,044	30,143	39,683	— 1,810	— 1,361
Foreign ...	26,481	22,654	25,370	22,327	— 1,111	— 327
<b>Total entered ...</b>	<b>58,434</b>	<b>63,698</b>	<b>55,513</b>	<b>62,010</b>	<b>— 2,921</b>	<b>— 1,688</b>
<i>Cleared with cargoes—</i>						
British ...	40,572	45,141	37,075	40,271	— 3,497	— 4,870
Foreign ...	23,775	23,797	20,987	21,527	— 2,788	— 2,270
<b>Total cleared ...</b>	<b>64,347</b>	<b>68,938</b>	<b>58,062</b>	<b>61,798</b>	<b>— 6,285</b>	<b>— 7,140</b>

deduction of re-exports only alters this proportion to a little over one-third. Exports in the class of "Articles wholly or mainly Manufactured" were less in value in the latest twelve months by about 32 per cent. than in the preceding period. The falling off in the import total for food, drink, and tobacco, after deducting re-exports, was about 14 per cent., while for the class of "Articles wholly or mainly Manufactured" the value of retained imports fell by 16 per cent.

Taking merchandise and bullion and specie together, the excess of imports over exports was £375,747,000 in the latest twelve months and £375,786,000 in the preceding period of twelve months. It may be presumed that the "invisible exports" have decreased by much more than the £39,000 which expresses the reduction in the value of the visible items. The tonnage of British vessels entered at United Kingdom ports with cargoes decreased by about 3.3 per cent., and that of British vessels cleared with cargoes by 10.8 per cent., while the figures examined above suggest that the vessels were, on the average, less fully loaded in the later period of twelve months. Thus the earnings of our merchant shipping have probably been reduced, since trading activity is being reduced elsewhere at the same time that the activities of our home ports are undergoing reduction. As the depression that has affected the shipping trade is felt severely elsewhere, the other, and more important, of the principal elements by which our excess of imports is paid for, namely, the return from our investments abroad, may be expected to have undergone reduction.

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Wholesale price levels in this country, as measured by the Board of Trade index-number, showed during March and April a continuation of the downward movement which had been proceeding month by month since October, 1929, when this index-number stood at 81.9 (1924 = 100). For the month of March the figure was 63.7, giving an aggregate decline since October, 1929, amounting to 22 per cent., to which food prices contributed by a fall of 23 per cent., and prices of industrial materials by one of 21 per cent. In comparison with the preceding month the fall in the general level in March was 0.3 per cent. Next month the decrease was only 0.2 per cent., which was the smallest percentage decline, as compared with the previous month, which had occurred in any month since the downward movement began, and left the general index-number at 63.6. The last-named figure was 14.5 per cent. below that of the year before (74.4); to this decline over the year the group averages, with one exception, all contributed, the most noticeable

reductions being cereals (24.7 per cent.), "other metals and minerals" (26.2 per cent.), cotton (22.6 per cent.), and textiles other than cotton and wool (32.6 per cent.). In view of the slowing up in the rate of decline in the prices of most of the groups of commodities covered by the index-number, the Board of Trade examined the prices in the first and second halves of March and April. This showed that the decline in industrial materials since the middle of March (from 62.1 to 61.3) was nearly counterbalanced by increases in the prices of food-stuffs (from 67.2 to 67.9), but it should be noted that these increases were partly of a seasonal character. If the average for the year 1913 be substituted as the base, the index-number for April was 105.7, that for food-stuffs being 112.6, and that for industrial materials being 102. Within these two major divisions the group indices ranged from 88.2 for cereals to 136.1 for "other foods," and from 77.7 for textiles other than cotton and wool to 107.7 for wool respectively.

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According to the *Statist* index-number of wholesale prices, the resistance to further deflation of prices which had been observable in December, January and February strengthened still further during March, so that at the end of that month this index-number was identical with the figure for a month before, viz. 85.5, a level within 0.7 per cent. of the average index-number measuring the level of wholesale prices in 1913, and 17 per cent. below the level of the end of March, 1930. As in the case of the Board of Trade index-number, this measure of stability was due to the offsetting of a slight improvement in the food-stuffs group by a proportionate decline in the materials group. The hope expressed by the *Statist* that this might prove to mark the turning-point in the cyclical movement of prices, unfortunately proved ill-founded, for during April the index-number took a new plunge downwards, reaching 84.4 at the end of that month, and so carrying the level below that of 1913. Of special significance is the fact that again raw materials prices were wholly responsible for the drop in the general level; while these fell by 3 per cent., food-stuffs actually advanced by 0.9 per cent. As raw materials prices are less subject than food-stuffs prices to purely seasonal factors, and so are generally a more sensitive indicator of business tendencies, the respective changes of these two groups in April did not augur well for the general recovery of price levels.

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The *Economist* index-number measured during March a decline of approximately one-half of 1 per cent. as against a rise of one-third of 1 per cent. recorded at the end of February. Thus, though there was on balance no decided tendency, as compared with the almost uniformly precipitate decline in the previous seventeen months, the level reached at the end of March was nevertheless the lowest point touched since the war. In April the recession in the level was still more marked, amounting to 1.2 per cent. and carrying the index-number to 65.4 (1927 = 100). On the 1924 basis it stood at 56.5 at the end of April, and on the 1913 basis the figure was 90. In the last-named average the only group index-number above the 1913 level was "other foods" at 106.1; the other food group, cereals and meat, stood at 98, while the figures for raw materials varied from 78.2 for textiles to 87.5 for minerals.

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According to the returns collected by the Ministry of Labour as to movements of retail prices in Great Britain and Northern Ireland, between February 28 and April 1, there were reductions in the prices of eggs, milk, butter, flour, beef, mutton, bacon and fish; potatoes, on the other hand, were slightly dearer. During April the price of potatoes advanced still further, and bacon, also became dearer, but several articles, notably milk and butter, fell in price. The net effect of these changes was that the general level of retail food prices, expressed as a percentage of the level in July, 1914, fell from 134 to 129 during March, and remained at 129 on May 1. If account be taken of all the items included in the budget in addition to food, the index-number of general retail prices, which stood at 150 on February 28, fell to 147 on April 1, at which figure it also stood on May 1. Since the expenditure on food represents 60 per cent. of the total expenditure in the original budget, it would appear that the level of retail prices other than food remained slightly less than 175, the principal items on May 1 being rent (154), clothing (195 to 200), and fuel and light (175).

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The following table summarizes for the principal countries the latest information as to retail prices overseas as reproduced in the *Labour Gazette*. The third column gives the estimated percentage increase in retail food prices on those ruling in July, 1914, or some similar pre-war period; the fourth column gives the estimated percentage increase for all the items covered by the budget in each case, such items, in addition to food, comprising, generally, rent, clothing, fuel and light, and other household requirements.



Country.	Date of Latest Return.	Food.	All Items.
		Percentage increase.	Percentage increase.
<i>Overseas, Dominions, etc.</i>			
Australia ... ..	March, 1931	31	41 (3rd qr. 30)
Canada ... ..	March, 1931	24	45
India (Bombay)*... ..	April, 1931	4	13
Irish Free State ... ..	January, 1931	54	66
New Zealand ... ..	April, 1931	25	49
South Africa ... ..	March, 1931	7	24
<i>Foreign Countries.</i>			
Belgium ... ..	March, 1931	—	715
Czechoslovakia ... ..	March, 1931	14	2 (Prague)
Denmark ... ..	April, 1931	23	57
Egypt (Cairo) ... ..	December, 1930	28	—
France (Paris) ... ..	April, 1931	527	490 (1st qr.)
France (other towns) ... ..	February, 1931	527	—
Germany ... ..	April, 1931	29	37
Holland (Amsterdam) ... ..	March, 1931	—	54
Italy ... ..	February, 1931	346 (Mar.)	394 (Milan)
Norway ... ..	April, 1931	41	68
Spain (Madrid) ... ..	February, 1931	96	—
Sweden ... ..	April, 1931	32	60
Switzerland ... ..	March, 1931	44	53
United States ... ..	March, 1931	24	61 (Dec.)

\* Native families.

With reference to statistics relating to employment in Great Britain and Northern Ireland quoted on p. 331 of Part II, 1931, of the *Journal*, the *Labour Gazette* reported that during March employment showed a slight improvement, which was mainly due to the seasonal revival in the building and clothing trades and to the recent improvement in the textile industries. This improvement on the whole was maintained during April. The following table summarizes the principal figures for the two months in comparison with the position of a month before and that of a year before.

Date.	Number of Persons on Employment Exchange Register.		
	Numbers Unemployed (excluding persons normally in casual employment).	Numbers Temporarily stopped.	Numbers Unemployed normally in casual employment.
Feb. 23, 1931 ... ..	1,858,716	613,692	115,250
March 23, 1931 ... ..	1,859,526	604,089	116,503
April 27, 1931 ... ..	1,848,170	556,978	114,965
April 28, 1930 ... ..	1,158,109	447,234	93,033

Among work-people insured against unemployment in Great Britain and Northern Ireland, the percentage unemployed in all

industries taken together on March 23 was 21.5, as compared with 21.7 on February 23, and a month later on April 27 it had fallen to 20.9. On April 28, 1930, the corresponding figure was 14.2 per cent.

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Official statements as to employment in Germany, quoted from the *Reichsarbeitsblatt* by the *Labour Gazette*, reported that no improvement in the position took place during February, and the improvement during March was due largely to seasonal influences. During February the total number of persons reported by the Employment Exchanges as available for and seeking work rose from 4,956,464 to 5,045,489, but by the end of March this figure had fallen to 4,830,126. For April 30 the provisional figure was 4,469,186. Similar movements were reported in the number returned as unemployed, which rose from 4,886,625 to 4,971,843 during February, fell to 4,743,931 during March, and according to a provisional estimate, fell further during April to 4,389,000. Among the members of national trade unions with a total membership of about 4½ millions, the percentage of unemployment rose from 34.2 on January 31 to 34.5 on February 28, then fell to 33.6 on March 28, as compared with 21.7 a year before. In France, where unemployment was at a very much lower level, there was an increase from 59,500 to 70,822 during March in the total number of persons on the registers of the Employment Exchanges, and during April this number fell to 66,957, as compared with 10,839 at the end of April, 1930. For Belgium the latest figures quoted relate to January and February, and are based upon returns from approved unemployment insurance societies with a total membership of nearly 700,000. During January the percentage of unemployment among members rose from 9.2 to 11.1, and during February it rose further to 11.6, or more than four times the rate of a year before. In the Scandinavian countries the Norwegian trade union returns of unemployment rose slightly during February from 20.4 to 20.6, while during the same month the corresponding percentage in Sweden fell from 19.8 to 18.3, though the latter figure was still considerably in excess of 13.2, the figure on February 28, 1930. In Denmark returns supplied to the Danish Statistical Department by trade unions and by the Central Employment Exchange gave an unemployment percentage of 24.2 at the end of January, and 25.6 at the end of February; at the end of the latter month in 1930 the figure was 20 per cent.

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In Canada the index-number of employment is based upon returns received from about 7,500 firms employing approximately 900,000 work-people, and has as its base the average volume of

employment during the year 1926. Standing at 100·7 at the beginning of February, this index-number fell a month later to 100·2, and still further to 99·7 on April 1, which was appreciably below the figure for April 1, 1930, viz. 107·8. The monthly report on employment issued by the Federal Department of Labour Statistics at Washington now rests upon returns received from about 44,000 establishments in various branches of industry and commerce, and covers more than 4½ million work-people. The report showed practically no change in the volume of employment during January, February and March. On the other hand, the index-number of employment, which has a more restricted base, being confined to manufacturing industries, rose steadily, if slightly, from 73·1 for January to 74·8 for March. For March, 1930, the index-number was 89·8.

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In Part I of *Journal* for this year we referred to the publication of the first part of *Statistical Tables relating to British and Foreign Trade and Industry* (1924-30). The second part, dealing with "Principal Industries: Production and Trade," has now been issued (Cmd. 3849). This deals with conditions in the principal industries, these being divided into twenty groups, while there is a concluding section on the food supplies of the United Kingdom. The general scheme followed for each industry is to summarize such public and private information of a statistical nature as is available regarding production in this country, making comparisons wherever possible with other countries, especially with Germany and the United States. A summary of the imports and exports of the raw materials and finished goods of the industry then follows, while foreign trade statistics are also given for some of the principal competing countries. Finally, a short review is given wherever possible of relevant wholesale prices. While it is no doubt true that specialists in individual industries could with some trouble get the information about their industries from other sources, the volume serves a very useful purpose in collecting the information for all the principal industries together. The general economist and statistician desiring information about industry will find the book of very considerable value. A commendable feature of the publication is that with the exception of import and export statistics, which are obviously taken from official trade returns, the original sources of all information are indicated. These two volumes will take their places with the "Statistical Abstracts" published by the Board of Trade and other Government departments on the bookshelves of all who have occasion to write or speak on matters concerning the industry and commerce of this country.

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We welcome the publication of the *Transactions of the Manchester Statistical Society* for the session 1928-29. It contains five papers (with discussions), the report and accounts of the Society, and a list of members, of whom there were 187 at the end of the session. The first paper is by Professor Henry Clay on "The Course of Employment since the War"; his first conclusion is that "between 1921 and 1923 the growth of the insured industries just about compensated for the decrease in employment offered by agriculture and railways, leaving the increase in population to be provided for elsewhere. The second is that the increase in employment since 1923 is not the result of a spontaneous and unaided development of the industries which have provided it. Largely, it is due to Government subsidies and selective Protection." Mr. Spurley Hey, M.A., Director of Education, Manchester, read the second paper, on "The Raising of the School-leaving Age," and, after statistical enquiry into Manchester conditions, he suggested: "(a) that it will be possible in 1933 to accommodate the additional children who would remain in the schools if the age were raised to fifteen years; (b) that the demand apparent in recent years for post-fourteen full-time education justifies the raising of the school-leaving age; (c) that in the case of certain types of children the raising of the school-leaving age is justifiable from a social point of view; (d) that Industry and Commerce would ultimately gain by the raising of the school-leaving age." Mr. Arthur Greenwood, M.P., in "Some Neglected Factors in Production," argued that "by far the greater part of local expenditure is upon services with which the community cannot dispense. These services are primarily preventive services. They have a constructive purpose. They are concerned with making the most of the 'man-power' of the nation. Such services include education, public health, housing and town-planning." Much of the present expenditure, he held, was due to past neglect, and industry must gain from improvement in the condition of its great army of consumers. Mr. Arno S. Pearse contributed a short paper on "Efforts to Rationalize the Cotton Industry of the U.S.A.," in which he drew attention to growing economies of labour in spinning and weaving, to the evolution of the "textile mill expert" (a specialist in cotton buying or an expert technician in carding or spinning or some other department), to the development of welfare work, to co-operation with foremen, and to combined efforts to find new uses for cotton. Lastly, Mr. F. J. Marquis, in "Problems of Retail Distribution," maintained that the large retailing unit, "by giving great prominence to the display of certain merchandise, has led people to place their orders for a similarity of goods, and has thus still further directed public demand

into narrower channels, and thereby has increased the opportunities for mass production." The wholesaler has suffered, but cheap retailing has led to a higher standard of living; the concentration of demand has enabled also the production of beautiful but yet cheap cloths in large quantities. He also commented on the importance of advertising, the cost of service, and the growth of hire-purchase, a system of buying of which he did not approve except in the case of houses.

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Fellows will be aware that the President has lately been on a mission to Canada, having been appointed by the Government of the Dominion to enquire into and report on grain marketing. We have advices from Canada that Sir Josiah made a most favourable impression on Canadians, and that in particular they have been moved by his continual insistence on the necessity of clear thinking on all economic matters.

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## OBITUARY.

### SIR HUGH BELL.

WE deeply regret to report the death of Sir Hugh Bell in London on June 29th, at the age of 87, after a brief illness. During his long life he was active in many capacities—as a leader in the coal, iron, steel, and chemical industries, as an educationalist, as an untiring municipal statesman, as a convinced exponent in speech and writing of free trade and individualism. Full accounts of his industrial and public career have been given in the public press and need not be repeated here. Throughout his long life he never rested; rest, quiescence, was unthinkable to him. Always was there something to be constructed or some error to be fought. He regarded his occupation as an ironmaster as a part of the common weal, and persistently and fiercely he contended for the right to contribute his share to the national welfare in co-operation with his workpeople and unfettered by the intervention of ignorant or interested outsiders, including therein Governments. He had a passion for freedom, and therefore *his* logic made him an individualist and a free-trader. But *there* with he combined a talent for co-operation, of which the long period of industrial peace on Tees-side was a proof. One always felt that he had a high opinion of his fellow-men and, therefore, he called on them to give to industry and the State the same hard work and clear

thought which were of the marrow of his being. If he over-estimated others, it was a noble error. Controversy in defence of his principles and ideals was his delight, but he was scrupulously fair. His stern intellectual integrity permitted him to mete out justice only.

Sir Hugh joined the Royal Statistical Society in 1919 at an age when most men are glad of repose. His public engagements did not allow him to take a great part in the work of the Society, but his interest in statistics was not the less keen, as was shown, *inter alia*, by his activity as a member of the Board of Trade Advisory Committee for the Census of Production. To all who came to him in quest of knowledge in his particular subjects he was generous in his help and, when he knew he could rely on the discretion of the enquirer, there were few limits to his assistance. Fellows will recall that he was present at the May meeting when Dr. Rhodes read his paper on "Labour and Output in the Coal-Mining Industry in Great Britain," and that his contribution to the discussion was characteristically humorous and precise. The members of the Statistical Dining Club, however, were privileged to see him in an aspect different from that of the industrial magnate and the politician with which the public was acquainted. There was never a dull evening when Bell was there. Incisive, witty, ironic in turns, his conversation played round any topic with a debonair lucidity reminiscent of a rapier handled by a master. He was ever of the most exquisite courtesy, without a trace of condescension; gentle and simple were alike to him, provided they were honest and sincere. And with children his manner was perfect; he loved them and they him. An age has closed, a great gentleman has passed away, and the world is the poorer for the change and the passing.

H. W. M.

# STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

## UNITED KINGDOM—

- Accountants' Magazine*, March, 1931—The value and limitation of costing in industry : *A. Cathles*.
- Bankers' Magazine*, April, 1931—War debts and the gold standard : *G. R. S. Gallaher*. The dawn of a new banking era : *H. C. Hodder*. German banking in its relation to industry : *H. E. Scott*.
- Economica*, May, 1931—The “paradox” of saving : *F. A. Von Hayek*. The theory of uncertainty and profit : *J. R. Hicks*. The payment of reparations : *Gilbert Walker*.
- Eugenics Review*, April, 1931—Studies of human hybrids : *J. A. Mj  en*. Improvement of live-stock : *A. D. Buchanan Smith*.
- Financial Review of Reviews*, April, 1931—Outlook for home rails.
- Institute of Actuaries, Journal*, Part II., 1930—Australian mortality : *C. H. Wickens*. Notes on the relative mortality of married men and on an experiment in forecasting the mortality over a limited period : *P. N. Harvey*.
- Institute of Bankers, Journal*—
- April, 1931—English and continental banking, I. : *P. Barrett Whale*.
- May, 1931—English and continental banking, II. : *P. Barrett Whale*.
- Lloyds Bank, Ltd., Monthly Review*, April, 1931—Unemployment insurance : *Walter Elliot*.
- Ministry of Agriculture, Journal*, April, 1931—Nutritional value of raw and pasteurized milk : *S. Bartlett*.
- Public Administration*, April, 1931—Some problems of local government : *I. G. Gibbon*. The new transport and its administrative problems : *Sir Cyril Hurcomb*.
- Royal Agricultural Society of England, Journal*, Vol. 91, 1930—College and institute farms : *J. G. Stewart*. Notable farming enterprises : *H. G. Robinson*. Economics in pig production : *Lord Phillimore*.

## INDIA—

- Indian Journal of Economics*, January, 1931—Some salient lessons from the foreign banking systems and their application to India proper : *B. Ramchandra Rau*. The central problem of Indian banking : *P. J. Thomas*. Credit and banking problems in India : *D. Pant*.

## UNITED STATES—

- American Academy of Political and Social Science, Annals, March, 1931*—The insecurity of industry. (Whole number.)
- American Economic Review, March, 1931*—Economic conflict in international affairs: *M. B. Hammond*. The large corporation in American economic life: *G. C. Means*. Advertising and economic theory: *C. A. Stocking*.
- *Supplement*—Papers and proceedings of the Forty-third Annual Meeting of the American Economic Association, including the following papers:—The Russian economic situation. Trustification and economic theory: *M. W. Watkins*. The persistence of the merger movement: *W. L. Thorp*. International industrial relations: migration of enterprise and policies affecting it: *John Donaldson*. The world-wide depression of 1930: *Carl Snyder*. The present depression: a tentative diagnosis: *Josef Schumpeter*.
- American Statistical Association, Journal, March, 1931*—Statistics and the scientific method: *M. C. Rorty*. The influence of population density on crime: *R. E. Watts*. Analysis of the spurious effect of high intercorrelation of independent variables on regression and correlation coefficients: *H. I. Richards*. The nature and use of the harmonic mean: *W. F. Feger*. A distortion in the cost of living index: *M. H. Hogg*. Extension of Fisher's formula number 353 to three or more variables: *J. K. Wisniewski*.
- *Supplement*—Papers and proceedings of the Ninety-second Annual Meeting of the American Statistical Association, including papers on the following subjects:—Statistics in specific industries; Statistical methodology; Relation of the American Statistical Association to international statistics; Institutional statistics; Wholesale commodity price indices; Security market analysis and forecasting; Measurements of employment and unemployment; The business depression of 1930; Analysis and forecasting of business cycles; Enumeration and sampling in the field of the census—vital statistics.
- Journal of Political Economy, April, 1931*—The economics of exhaustible resources: *H. Hotelling*. Professor Fisher's interest theory: a case in point: *F. H. Knight*. Some theoretical aspects of stock-market speculation: *H. Richter-Altschaeffer*.
- Monthly Labor Review*—
- March, 1931*—"Spotty" character of employment changes in manufacturing industries. Unemployment survey of Metropolitan Life Insurance Company.
- April, 1931*—Cost of family relief in 100 cities, 1929 and 1930: *Glenn Steele*. Accident experience in the iron and steel industry.
- Quarterly Journal of Economics, May, 1931*—The Federal Reserve Act and Federal Reserve policies: *S. E. Harris*. International and domestic commodities and the theory of prices:



UNITED STATES—*Contd.*

*L. B. Zapolon.* The comparative fertility of the native and the foreign born women in New York : *J. J. Spengler.* Stock dividends, large scale business, and corporate savings—a criticism : *G. C. Means.*

*Review of Economic Statistics, February, 1931*—The copper industry in 1930 : *F. E. Richter.* The money market in 1930 : *W. Randolph Burgess.*

*Wheat Studies of the Food Research Institute*—

*January, 1931*—Survey of the wheat situation, August to November, 1930.

*February, 1931*—Speculation, short selling, and the price of wheat.

*March, 1931*—Official and unofficial statistics of international trade in wheat and flour.

ARGENTINA—

*Revista de Ciencias Económicas*—

*December, 1930*—La evolución socialista de post-guerra : *A. Bunge.* Las principales doctrinas financieras : *R. Salerno-Dalla Volta.*

*January, 1931*—La crisis europea : *Baltasar Brum.* La nación Argentina necesita definir su política comercial del azúcar : *E. J. Ferrarazzo.*

BELGIUM—

*Bulletin de l'Institut des Sciences Économiques, March, 1931*—Le chômage en 1930 : *Robert Schepens.* La conjoncture économique de la Belgique : *L. H. Dupriez.*

DENMARK—

*Nationaløkonomisk Tidsskrift, Hefte 1-2, 1931*—Några Synpunkter på "den internationella Agrarkrisen" : *Emil Sommarin.* Kan man ud fra Driftsbureauets Regnskabsmateriale beregne, hvilken Jordbrugstype der betaler Produktionsfaktorerne bedst? Bemærkninger til A. Jensen : *J. Petersen.* Gensvar til J. Pedersen : *A. Jensen.*

EGYPT—

*L'Égypte Contemporaine, March, 1931*—Les crises économiques et la dépression présente : *U. Ricci.* L'influence de la spéculation sur les fluctuations des prix du coton (avec un graphique hors texte) : *C. Bresciani-Turroni.* Egyptian cotton from the points of view of the spinning industry : *A. S. Pearse.*

FRANCE—

*Bulletin de la Statistique Générale de la France, January-March, 1931*—Natalité et accroissement de la population en France et à l'étranger avant et après la guerre : *Raoul Husson.*

*Bulletin de Statistique et de Législation Comparée, October, 1930*—Les taxes assimilées.

FRANCE—*Contd.*
*Journal des Économistes*—

March, 1931—La question de l'or et la question de l'argent : *Edouard Payen*. La situation économique de la Roumanie (1918-28) : *E. Lémonon*. La République Argentine : *R. J. Pierre*. Quelques interprétations des statistiques commerciales courantes : *M. Carsow*.

April, 1931—Le commerce extérieur des principaux pays en 1930 : *R. J. Pierre*. Le problème du continent américain : *L. G. Numile*.

*Journal de la Société de Statistique de Paris*—

April, 1931—La densité de la population et la mortalité : *P. Bourdeix*. Production et fabrication des stupéfiants par pays : *Raymond Mage*. Superficie, population et religions de la terre : *Raymond Pearl*.

May, 1931—La génération comme unité de mesure dans les calculs sur l'hérédité : *Louis Marin*. La densité de la population et la mortalité (suite) : *Pierre Bourdeix*. À propos de l'accroissement de la mortalité attribuée au cancer : *Marcel Moine*.

*Revue d'Économie Politique*, January-February, 1931—La question de l'or devant la Société des Nations : *Bertrand Nogaro*. Que faut-il entendre par le coût de la guerre : *Charles Gide*. Les facteurs de dépression d'après les banquiers anglais : *Louis Baudin*. Dumping ordinaire et dumping soviétique : *B. Eliacheff*.

## GERMANY—

*Blätter für Versicherungs-Mathematik*, April, 1931—Deutsch-englisches lebensversicherungstechnisches Wörterbuch : *W. F. Gardner*. Erwiderung betreffend die Güte von Sterbetafeln : *Karl Freudenberg*. Schlusswort über die Güte von Sterbetafeln : *E. J. Gumbel*. Der Kampf um die Formel für die säkularen Sterblichkeitsschwankungen : *Paul Riebesell*.

*Deutsches Statistisches Zentralblatt*, January-February, 1931—Vorausberechnungen über Bevölkerungsentwicklung : *Friedrich Hage*.

*Vierteljahrshefte zur Konjunkturforschung*, Sonderheft 21, 1931—Der Trend. Ein Beitrag zur Methode seiner Berechnung und seiner Auswertung für die Untersuchung von Wirtschaftskurven und sonstigen Zeitreihen : *Paul Lorenz*.

*Weltwirtschaftliches Archiv*, April, 1931—Wirtschaftsverfassung, Geldverfassung und Reparationen : *Eduard Lukas*. Der Kreislauf des Geldes : *Hans Neisser*. The resource hierarchy of modern world economy : *W. Zimmermann*. Essay on changes in the distribution of British overseas trade in wool textiles during the past ten years : *George H. Wood*. Die Entwicklung der europäischen Finanzmonopole in der Nachkriegszeit. 1: Die Entwicklung der Tabakmonopole : *Herbert Gross*.

GERMANY—*Contd.*

*Zeitschrift für die Gesamte Versicherungs-Wissenschaft*, April, 1931  
—Die Produktivität der Versicherung: *W. Weddigen*.  
Zukunftsaufgaben der Versicherungs-mathematik: *F. Bernstein*.

HUNGARY—

*Journal de la Société Hongroise de Statistique*—

No. 3, 1930—Le problème économique de la Hongrie actuelle :  
*Eraldo Fossati*. La politique agraire en Europe avant et  
après la guerre: *Bela Kenéz*.

No. 4, 1931—Le recensement de la population de 1930 en  
Hongrie: *Aloys Kovács*. La population standard: *Charles  
Schneller*.

ITALY—

*Le Assicurazioni Sociali*, No. 1, 1931—La politica demografica  
dell'Italia e le sue finalità: *Prof. Franco Savorgnan*. La  
disoccupazione: nuovo esame delle sue cause mondiali: *J. L.  
Cohen*. La riforma dell'assicurazione disoccupazione in  
Austria: *Max Lederer*.

*Giornale degli Economisti e Rivista di Statistica*—

*February*, 1931—Le variazioni di lunga durata del livello dei  
prezzi mondiali: *Alberto Breglia*. Effetti delle variazioni del  
potere d'acquisto dell'oro: *Giorgio Mortara*. Osservazioni  
sull'andamento della crisi di Wall Street: *E. Corbino*.

*March*, 1931—Conseguenze dei prestiti di stato sul mercato dei  
capitali: *G. U. Papi*.

*Giornale dell'Istituto Italiano degli Attuari*, April, 1931—Nuove  
formule relative al giuoco di testa e croce: *Paul Lévy*. Sulle  
regressioni multiple: *V. Romanovsky*. Sulla funzione di  
frequenza binomiale: *A. Guldberg*. La mortalità per  
suicidio tra gli assicurati dell'Istituto Nazionale delle Assi-  
curazioni nel decennio 1920-29: *I. Romanelli*.

*Giornale di Matematica Finanziaria*—

*February*, 1931—Sull'adeguamento dei costi delle assicurazioni  
sociali alla potenzialità economica della nazione: *F. Insolera*.  
The valuation of a continuous survivorship annuity with  
refund of an arbitrarily assigned part of the purchase price:  
*F. M. Weidu*. On the oldest age: *F. Insolera*.

*La Riforma Sociale*, March-April, 1931—Crisi economica, prote-  
zionismo ed alti salari: *E. Giretti*. L'espansione commerciale  
vista dal lato tributario: *G. di Paolo*.

*Rivista Italiana di Statistica*, January-March, 1931—Il barometro  
internazionale degli affari e il problema dell'oro. Le nascite  
e la biologia. L'elasticità dei consumi: *F. Vinci*. Crisi  
britannica: *G. Graziosi*.

## LIST OF ADDITIONS TO THE LIBRARY.

Since the issue of Part II, 1931, the Society has received the publications enumerated below :—

## 1.—OFFICIAL PUBLICATIONS.

## (a) United Kingdom and its several Divisions.

## United Kingdom—

*Empire Marketing Board—*

Statistics and Intelligence Branch. Production and trade of the following countries :—Australia, 27 pp.; Irish Free State, 18 pp.; Sierra Leone, 17 pp. London: H.M.S.O., 1931. 9½" × 7¼". 2d. each. (The Board.)

The demand for tinned fruits. Report of an investigation into the retail marketing of canned fruits in the United Kingdom. 9½" × 7½"; 46 pp. London: H.M.S.O., 1931. 1s. (The Board.)

Imperial Wool Research Conference, 1930. London, Leeds, and Edinburgh. Report of proceedings. 9½" × 7½"; 107 pp. London: H.M.S.O., 1931. 1s. (*Id.*)

*Imperial Economic Committee*. Eighteenth report. Tea. 9½" × 6"; 74 pp. London: H.M.S.O., 1931. 6d. (The Publishers.)

*Industry and Trade, Committee on*. Minutes of evidence taken before the Committee, 1924–27. Vols. I, II, III. 13½" × 8½".

*Labour, Ministry of*. Twentieth abstract of labour statistics of the United Kingdom. Cmd. 3831. 9½" × 6"; 205 pp. London: H.M.S.O., 1931. 3s. 6d.

*Overseas Trade, Department of—*

Reports on economic conditions in the following countries: Australia (Dec., 1930), 237 pp., 3s. 6d.; Belgium in 1930. With annex on the Grand Duchy of Luxemburg, 153 pp., 4s.; Brazil (Dec., 1930): with regional reports on H.M. Consular Officers at São Paulo, Bahia, Pernambuco, Para and Porto Alegre, 110 pp., 3s. 6d.; Denmark (Feb., 1931), 64 pp., 2s.; Dominican Republic and Republic of Hayti (to Nov., 1930), 56 pp., 1s. 9d.; Mexico (Jan., 1931), 44 pp., 1s. 6d.; Poland (1930), 56 pp., 1s. 6d.; United States of America (March, 1931), 112 pp., 3s. London: H.M.S.O., 1931. 9½" × 6". (The Department.)

Report of the United Kingdom Trade Mission to Egypt, February–March, 1931. 9½" × 6"; 89 pp. London: H.M.S.O., 1931. 1s. 6d. (*Id.*)

Report of the British Economic Mission to the Far East, 1930–31. 9½" × 6½". London: H.M.S.O., 1931. 1s. (*Id.*)

*Trade, Board of—*

Census of Production, 1924. Final report. The food, drink, and tobacco trades and the clothing trades. 9½" × 6"; 353 pp. London: H.M.S.O., 1931. 5s. 6d.

Statistical tables relating to British and Foreign trade and industry (1924–30). Part II. Principal industries, production and trade. 9½" × 6"; 513 pp. London: H.M.S.O., 1931. 7s. 6d. (The Board.)

*Transport, Ministry of*. Report of the Committee on Main Line Railway Electrification, 1931. 13½" × 8½"; 57 pp. London: H.M.S.O., 1931. 3s.

(a) United Kingdom and its several Divisions—*Contd.*

## England and Wales—

*Health, Ministry of—*

Reports on public health and medical subjects, No. 62—A review of certain present aspects of small-pox prevention, in relation particularly to the Vaccination Acts, 1867-1907. 9½" × 6½"; 67 pp. 1s. No. 63—A memorandum on bovine tuberculosis in man. With special reference to infection by milk. 9½" × 6"; 25 pp. London: H.M.S.O., 1931. 6d. (The Ministry.)

Cancer—VIII. Memorandum on cancer of the lip, tongue, and skin. 9½" × 6"; 17 pp. London: H.M.S.O., 1931. 3s. (H.M.S.O.)

*Home Office.* Criminal statistics, 1929. 9½" × 6"; xxxii + 197 pp. London: H.M.S.O., 1931. 3s. 6d.

*Industrial Fatigue Research Board.* Report No. 62. Two studies of absenteeism in coal mines. I. The absenteeism of miners in relation to short time and other conditions. II. A study of absenteeism at certain Scottish collieries. 9½" × 6"; 59 pp. London: H.M.S.O., 1931. 1s. (Medical Research Council.)

## (b) India, Dominions, and Protectorates.

## India—

Imperial Library, Calcutta. Report on the working of the Library, April 1st, 1926 to March 31st, 1930. 9½" × 6½". 22 pp. Calcutta, 1930. (The Library.)

*Meteorological Department—*

Scientific notes. Vol. I. No. 8—Monthly normal isobars and wind-roses at 1.5, 1.2, and 3 km. above sea-level over India and neighbourhood. 10" × 6½"; pp. 109-112 + 48 diagrams. Calcutta, 1931. 6s. 9d. (The Department.)

— Vol. III. No. 20—Correlation between rainfall in N.W. India and height of Indus river at Bukkar. Pp. 15-20. 8d. No. 21—Upper air circulation over India and its neighbourhood up to the Cirrus level during the winter and the monsoon. Pp. 21-27, 13 graphs. 3s. 6d. Calcutta, 1930. 10" × 7". (*Id.*)

*Madras.* District Gazetteers, Statistical appendix for Madras district. Vol. II. 9½" × 6"; iv + 156 pp. Madras, 1930. 2 Rs. 10 as.

## Canada—

Department of the Interior. National Development Bureau. The province of Nova Scotia. Resources and development. 4th ed. 9½" × 6½"; 157 pp. Ottawa, 1930. (The Department.)

## New Zealand—

Census and Statistics Office. Population census, 1926. Vol. XIII—Dwellings. 66 pp., 3s. Vol. XVII—General report. 100 pp. 5s. Wellington, 1931. 12½" × 9½". (The Office.)

## Irish Free State—

Industry and Trade, Department of. Census of production, 1926. Reports Nos. 12-18 inclusive, on the following industries:—Clothing, 16 pp.; linen, cotton, hemp and jute and canvas, 5 pp.; sugar, confectionery and jam-making, 5 pp.; fertilizer, chemical, drug, and paint, 6 pp.; aerated waters, cider, cordials and cognate liquors, 5 pp.; laundry, dyeing and cleaning, 5 pp.; bread, flour, confectionery and biscuit-making, 8 pp. Dublin, 1931. 13" × 8½". (The Department.)

## (c) Foreign Countries.

## Chile—

Dirección General de Estadística. Decreto organico. Numero 4610 bis 22 de Agosto de 1930, del Ministerio de Hacienda. 7½" × 5"; 12 pp. Santiago, 1930. (Dirección General de Estadística.)

(c) Foreign Countries—*Contd.*

## China—

*Shanghai*. Bureau of Social Affairs. Industrial disputes (not including strikes and lock-outs) in Greater Shanghai, 1929. 10 $\frac{1}{2}$ "  $\times$  7 $\frac{1}{2}$ "; 164 pp. Shanghai: Commercial Press, 1931. \$5.00. (The Bureau.)

## Czechoslovakia—

Recensement de la population, 1921. Tome II. Profession de la population. 12"  $\times$  9 $\frac{1}{4}$ "; xxviii + 215 pp. Prague, 1927. 80 Kč. (L'Office de Statistique.)

Recensement des maisons et des logements, 1921. 12 $\frac{1}{2}$ "  $\times$  9 $\frac{1}{4}$ "; vi + 205 pp. Prague, 1929. 40 Kč. (*Id.*)

## Egypt—

Agriculture, Ministry of. Co-operative section. Pamphlet No. 16. A glimpse of Egyptian co-operation. 9"  $\times$  6 $\frac{1}{4}$ "; 6 pp. Cairo, 1931. (The Ministry.)

## Germany—

Statistik des deutschen Reichs—

Band 375. Die Einkommen- und Körperschaftsteuerveranlagungen für 1926 und 1927. 14"  $\times$  10 $\frac{1}{2}$ "; 439 pp. Berlin, 1931. 25 *Rm.* (Statistisches Reichsamt.)

Band 378. Der Steuerabzug vom Arbeitslohn im Jahre 1928. 13 $\frac{1}{2}$ "  $\times$  10 $\frac{1}{2}$ "; 220 pp. Berlin, 1931. 20 *Rm.* (*Id.*)

Monatliche Nachweise über den auswärtigen Handel Deutschlands. Ergänzungsheft II. Gesamteigenhandel, Generalhandel, Veredelungsverkehr, Niederlageverkehr, Durchfuhr Zollerträge, Einfuhrscheine, 1930. 11 $\frac{1}{2}$ "  $\times$  8 $\frac{1}{2}$ "; 112 pp. Berlin, 1931. 5 *Rm.* (*Id.*)

Sonderhefte zu Wirtschaft und Statistik Nr. 8. Industrielle Produktion. Sammlung produktionsstatistischer Ergebnisse bis zum Jahre 1930. 11 $\frac{1}{2}$ "  $\times$  8 $\frac{1}{2}$ "; 207 pp. Berlin: Reimar Hobbing, 1931. 7.60 *Rm.* (*Id.*)

Volks-Berufs- und Betriebszählung. Band 408. Die berufliche und soziale Gliederung des deutschen Volkes. 342 pp., 11 *Rm.*; Band 412, Teil II—Landwirtschaftliche Betriebszählung. Die Landwirtschaft im deutschen Reich. Textband. 193 pp., 6.25 *Rm.* Berlin, 1931. 13 $\frac{1}{2}$ "  $\times$  10 $\frac{1}{2}$ ". (*Id.*)

## Hungary—

Ungarisches Wirtschafts-Jahrbuch VI. Jahrgang, 1930. Herausgegeben von Dr. Gustav Gratz. 8 $\frac{3}{4}$ "  $\times$  6"; 432 pp. Berlin: Carl Heymann, 1931. (Le Service Hongrois des Echanges Internationaux.)

## Mozambique—

Esboco geografico da Colónia na escala de 1/1.000.000. Maps Nos. 1 and 2, 33 $\frac{1}{2}$ "  $\times$  30 $\frac{1}{2}$ ". Nos. 4, 6 and 8, 24"  $\times$  32". (Direcção dos Serviços de Agrimensura.)

Moçambique na exposição Ibero-Americana. Relatório do Delegado da Colónia, 1929–30. 9 $\frac{1}{2}$ "  $\times$  7"; 116 pp. Lourenço Marques, 1931.

## Netherlands, East Indies—

Mededeelingen van het Centraal Kantoor voor de Statistiek, No. 92. Statistiek van de inschrijvingen in de Registers van den Burgerlijken stand voor Europeanen 1929. 9 $\frac{1}{2}$ "  $\times$  6 $\frac{1}{2}$ "; 42 pp. Batavia, 1931. (Departement van Landbouw, Nijverheid en Handel.)

Population census, 1930. Preliminary results. Part II. Outer Provinces. 10 $\frac{1}{2}$ "  $\times$  7"; xxxi + 47 pp. Batavia, 1931. (Departement van Landbouw, Nijverheid en Handel.)

## Russia—

*Ukraine*. Academy of Sciences. Mortality in four largest cities of the Ukraine in 1923–29. Part I. Tabular statistical data. 10"  $\times$  7"; 96 pp. Kiev, 1930. (The Academy.)

(c) Foreign Countries—*Contd.*

## Spain—

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**JOURNAL**  
**OF THE ROYAL STATISTICAL SOCIETY**  
**PART IV, 1931.**

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LABOUR AND OUTPUT IN THE COAL-MINING INDUSTRY  
IN GREAT BRITAIN.

By E. C. RHODES, D.Sc.

[Read before the Royal Statistical Society, May 19, 1931,  
the President, SIR J. C. STAMP, G.B.E., LL.D., D.Sc., in the Chair.]

*1. Output per Worker in Industry.*

ONE of the chief difficulties confronting anyone interested in relating the production of a particular industry to the number of workpeople employed arises when comparisons are made between the production in one period with the production in another period. In many industries the final products are so diverse in character and may change their nature to such an extent that it is difficult to be able to assert with safety that, for instance, production has increased by 5 per cent. between this period and that. There is no absolute unit which remains constant. In the case of the Coal-mining Industry this difficulty does not arise; here we have a constant unit—a ton of coal—and, moreover, we are enabled to differentiate between coal from different districts, though we cannot differentiate between coal from different mines. Certainly, the Coal-mining Industry is one of the few where we feel safe, when using published statistics, in asserting that the Output has changed by so much per cent. between different periods. Another difficulty confronting an investigator arises when considering the number of men employed. Generally speaking, one may be able to arrive with reasonable accuracy at the number of men employed in a given period, without at the same time knowing anything in detail of the length of time worked by the workpeople on their jobs; and from one time to

another quite considerable changes may take place in the time worked; short time or overtime may be prevalent, and any deductions made from the output and the number of men employed may be erroneous, unless there is at the same time knowledge of the amount of time worked. In the case of the Coal-mining Industry, this difficulty does not appear to arise, because we have available information as to the number of units of labour worked, viz. the number of man-shifts, not merely the number of men employed. So that in the case of this Industry we can make a safe direct comparison between the number of Labour units worked and the number of Output units evolved as a result of this labour.

## 2. *The Data.*

In recent years considerable detailed information on these points is available from the Quarterly Statistical Summaries issued by the Mines Department, and other information is also available in the Annual Reports of the same Department. Both these sources have been used freely in the following. The data published in the Quarterly Summaries refer to practically the whole Industry in Great Britain; the particulars shown therein are obtained from undertakings producing from 92 to 98 per cent. of the total amount of coal raised during the period with which we are concerned. The period under review is divided into two parts: the first from 1921, fourth quarter, to 1926, first quarter; the second from 1927, first quarter, to 1930, second quarter; the 1926 Coal Stoppage separating them. In the first period the seven-hour day was the legal maximum; in the second period the eight-hour day was the legal maximum. From these Summaries the data referring to the six main producing districts only have been utilized; these districts are—(1) South Wales and Monmouth, (2) Scotland, (3) Lancashire, Cheshire and North Staffordshire, (4) Yorkshire, Nottinghamshire, Derbyshire, Leicestershire, Cannock Chase and Warwickshire, (5) Durham, (6) Northumberland; and they will be referred to as (1) S. Wales, (2) Scotland, (3) Lancashire, (4) Midlands, (5) Durham, (6) Northumberland. For each of these six districts the following details have been extracted from the Quarterly Summaries: (a) the Output of Coal, being the tonnage of saleable coal raised; (b) the Number of Workpeople employed; (c) the Number of Man-shifts worked, divided into (i) the Number of Man-shifts worked at the Coal-face, (ii) the Number of Man-shifts worked elsewhere below ground, (iii) the Number of Man-shifts worked on the surface. From the total Number of Man-shifts worked and the Number of Workpeople employed we shall derive a further set of figures—the average number of shifts worked per

worker each quarter. As continual reference will be made to these it is better to use abbreviations, which will be as follows :—

- (a) Output, referred to as O.
- (b) Workpeople employed, referred to as W.
- (c) Man-shifts worked, total, referred to as M.
- (c) (i) Man-shifts worked at Coal-face as C.
- (c) (ii) Man-shifts worked elsewhere below ground as E.
- (c) (iii) Man-shifts worked on Surface as S.
- (d) Average number of shifts worked per worker is referred to as D.

From the Annual Reports of the Mines Department figures have been extracted, giving from quarter to quarter for each of the six districts the average number of days the mines wound coal. These figures are referred to as D', and are utilized for comparison with the figures obtained from the Statistical Summaries, although properly they are not really comparable, since the figures from the Annual Reports relate to the whole Industry, while, as has been stated, the quarterly figures obtained from the Statistical Summaries relate only to a part of the Industry; but as this is the major part, we are reasonably justified in utilizing statistics from these two sources and making relevant comparisons, so long as these lead only to broad conclusions.

### *3. Variations in Labour producing Unit Output.*

As our main purpose is to examine the changes taking place in the Output consequent on changes having been made in the number of Labour units worked, the obvious thing to do is to relate the number of man-shifts worked at the Coal-face, elsewhere below ground and on the surface to the Output. Now, as a rule, when this is done the relationship is expressed in the form : Output per man-shift; in the following, it is found preferable to express this relationship in the inverted form : man-shifts per Output, especially as the Output is used as the relative when dealing with Costs; we say : wages costs per ton, other costs per ton, and so on. Thus, we will first consider the results of dividing the number of man-shifts worked by the Output resulting, that is, we obtain C/O, E/O, S/O. An examination of these will show whether any alterations take place from time to time in the number of Labour units necessary to produce unit Output; we may find out if such changes take place, whether there is a recurrent change, what is its nature, if there is a secular change, what is the cause of such change, and so on. The movements in these ratios, C/O, E/O, S/O, are shown below diagrammatically for

the periods under review for each of the six districts. For the convenience of making comparisons these diagrams are on logarithmic

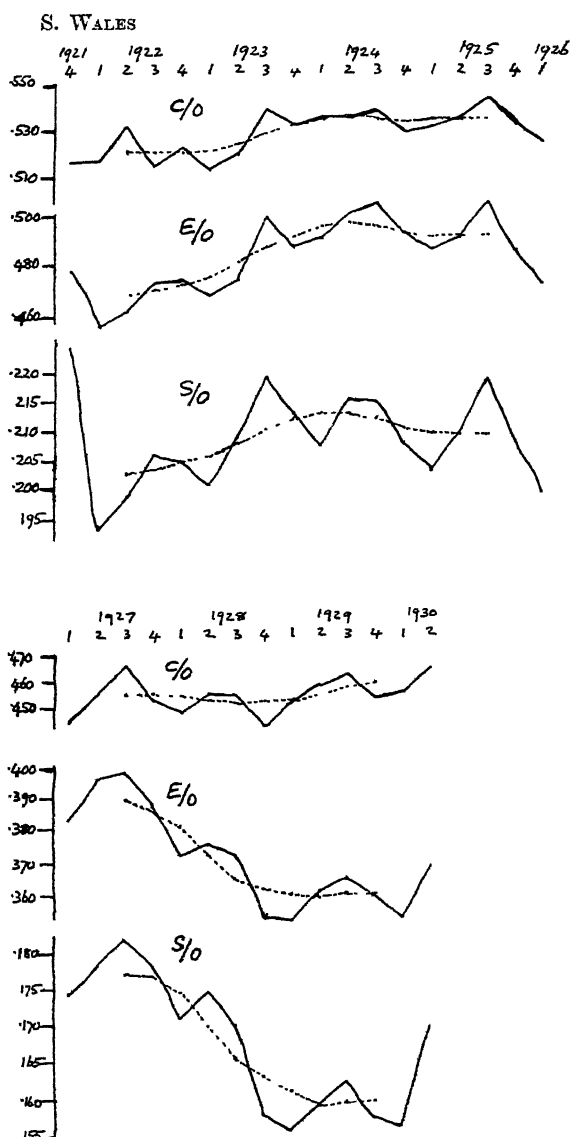
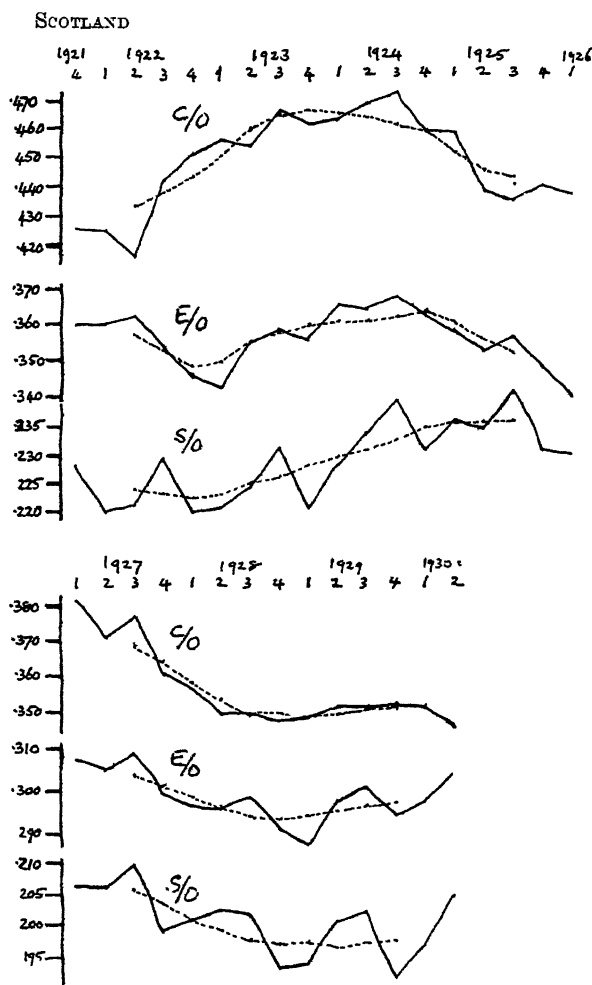


DIAGRAM 1.

scales, where vertical changes of the same apparent amounts correspond to *relative* changes of the same degree, and not *absolute* changes.

## (a) Seasonal Variations.

A glance at these diagrams is sufficient to make one realize that changes in these ratios do take place—in some cases considerable changes. Perhaps the most striking feature, at first sight, is the



regularity in certain of them of the fluctuations, especially in S/O. Generally, we may assert, these ratios tend to be higher in summer and lower in winter. Relatively S/O exhibits the most violent up-and-down movement, then E/O with somewhat less violent up-and-down movement, then C/O with still less violent



movement of this nature. Note especially the large relative changes in the case of Lancashire, and the smaller relative changes in the case

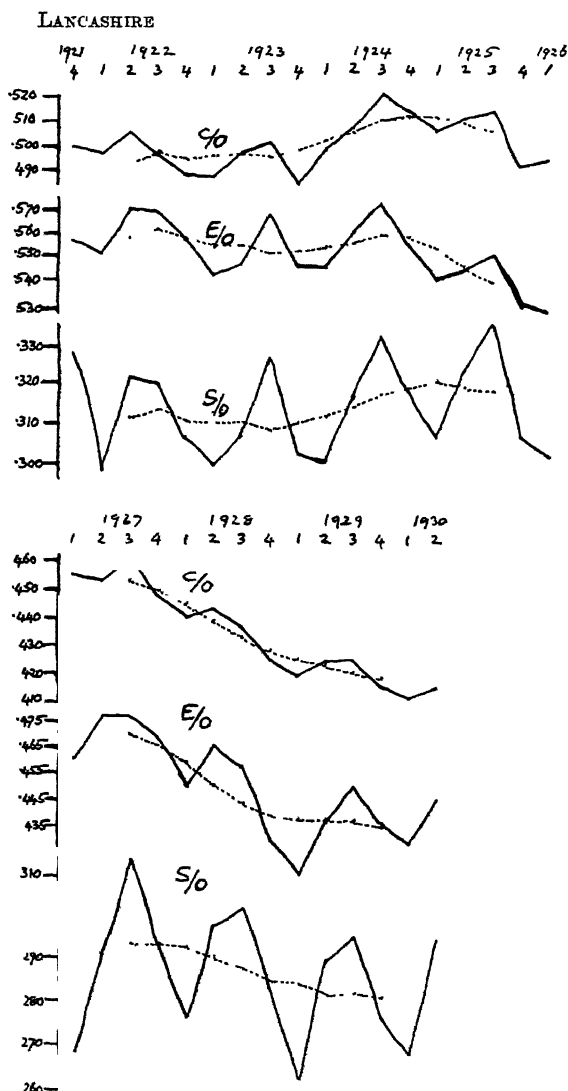


DIAGRAM 3.

of Durham. In general, therefore, it is evident that more Labour units are expended on the average at the Coal-face, elsewhere below ground and on the surface in the production of a ton of coal in summer than in winter, and this excess, roughly speaking, is

noticeable most in Lancashire and least in Durham. This seasonal movement must be susceptible of a simple explanation, involving characteristics of the Industry with which we are concerned. At any rate, it is well to observe the existence of this movement, so that

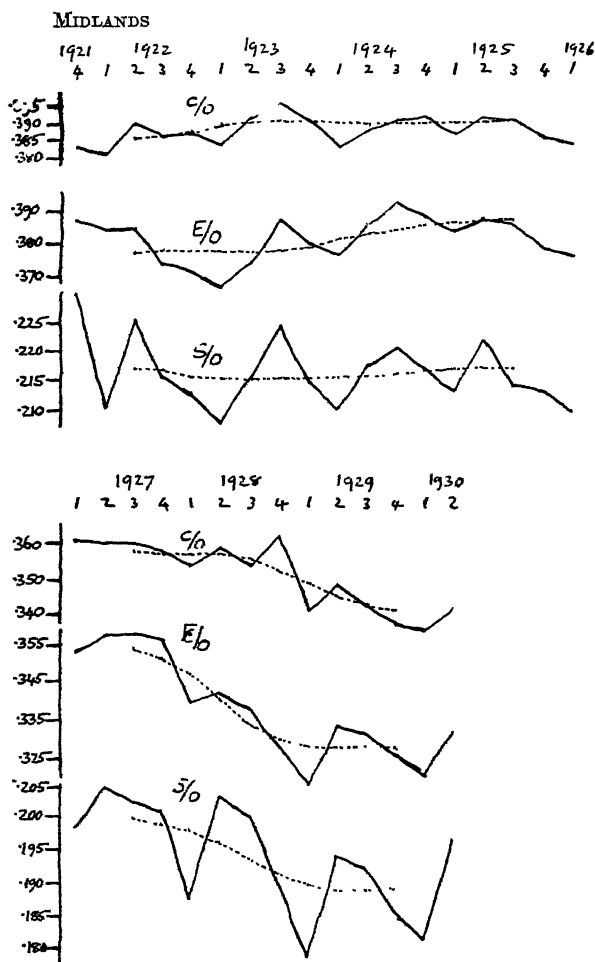


DIAGRAM 4.

when making comparisons with the idea of deducing general tendencies of changes taking place, we do not compare, say, figures for the first quarter with those for the third quarter, and so confuse the issue by introducing the complication of a regular seasonal movement of considerable size. It is probably reasonable to reject the simple explanation that the amount of energy involved in the expenditure of

one Labour unit is less in summer than in winter, that a man works less hard in summer than in winter, and the explanation must be sought in the natural fluctuating character of the Coal Industry itself, and the changes in the organization of the Industry made in

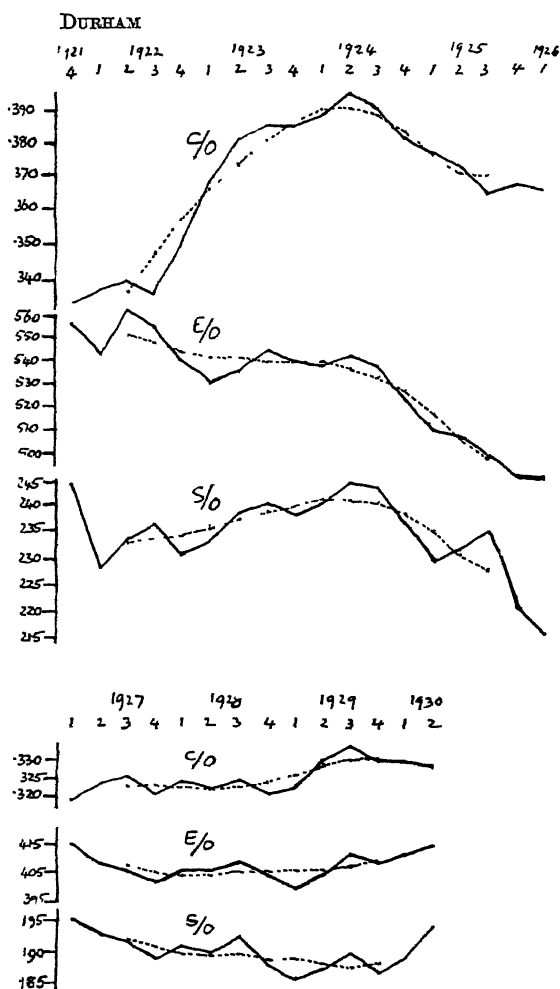


DIAGRAM 5.

response to these fluctuations. In general, there is more demand for coal in winter than in summer, and there are greater fluctuations in the demand for home consumption than for export. Lancashire and the Midlands mainly produce for the home trade, and S. Wales, Durham and Northumberland for export. The Industry must

accommodate itself to these fluctuations in demand. There are three variable characters in the Industry which may be altered from time

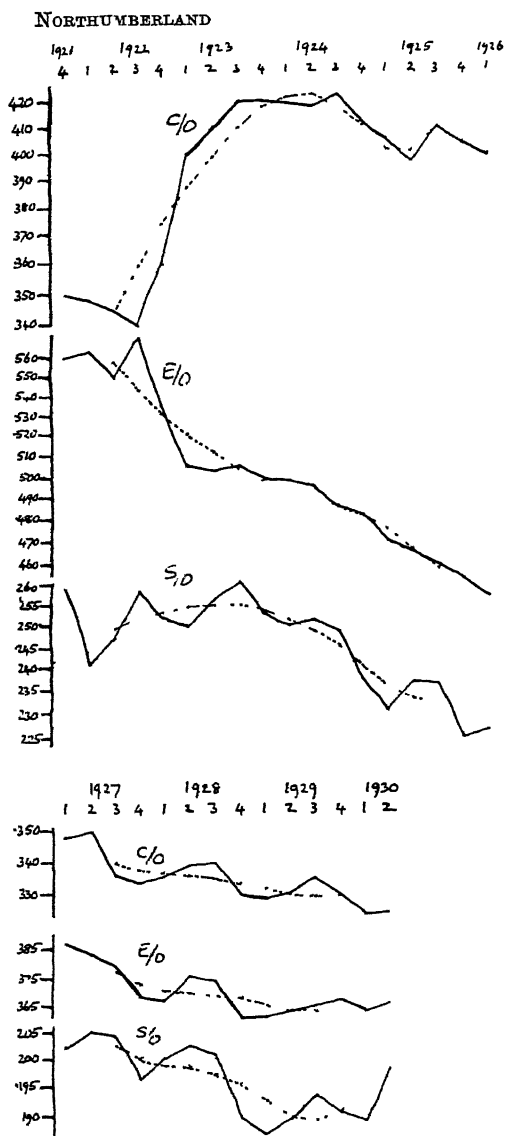


DIAGRAM 6.

to time in response to quick changes in the demand for its product, viz. the number of mines worked, the number of days mines working

wind coal, and the number of men employed.\* When changes are made from winter to summer and vice versa, some or all of these variables may be changed, and in summer some or all mines are working below capacity. Herein lies the explanation of the up-and-down movements observed in the ratios C/O, E/O, S/O. Also in a coal mine there are certain necessary functions which must be performed practically irrespective of the quantity of coal brought to the surface; ventilation must be continued, work must be done in pumping water, maintaining roads, falls of the roof must be prevented, and so on. Consequently, this kind of labour is unduly prominent when the Output is lowered, and the kind of movements noticeable in the diagrams, especially prominent in S/O and E/O, are emphasized on this account.

(b) *Secular Variations.*

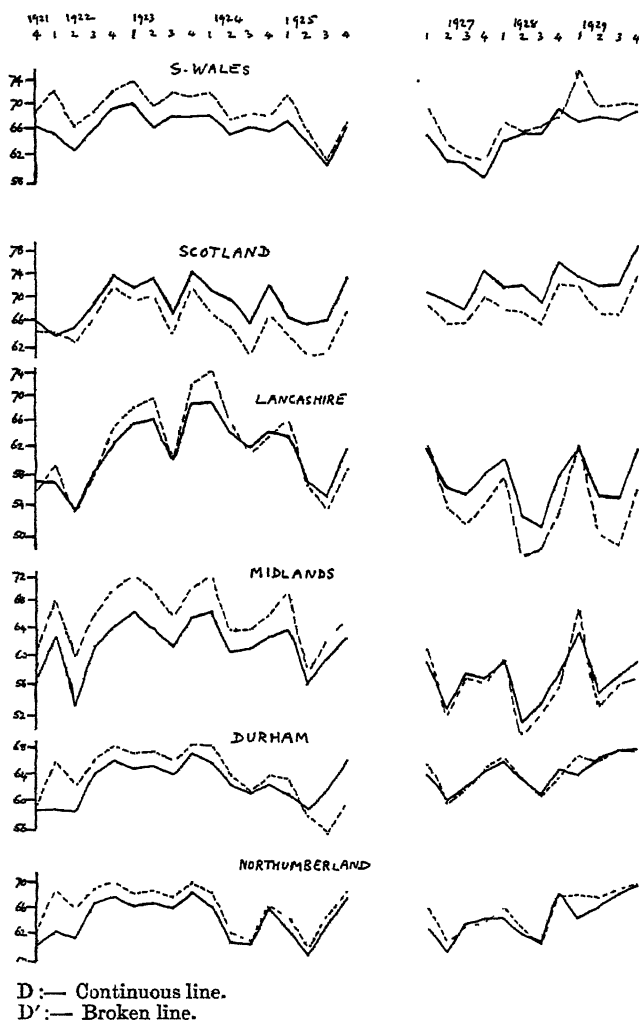
If we disregard, for the moment, the fluctuations in our diagrams, and concentrate on the changes which take place over the whole of the periods under review, we note that in some cases there are considerable changes. In S. Wales on the whole C/O, E/O, S/O have all increased from 1921 to 1926, and C/O is practically the same from 1927 to 1930, but E/O and S/O have decreased considerably between these two dates. In Scotland, quite large relative changes take place in C/O in the first period, E/O is roughly at about the same level, and S/O has increased from 1921 to 1926. In the period after the Coal Stoppage in 1926 all three have declined somewhat, C/O most. In Lancashire C/O has increased somewhat, E/O has declined a little, and S/O has increased a little in the first period, and all three have decreased in the second period from 1927 onwards. In the Midlands the general levels are practically the same in all three cases in the period 1921 to 1926, but declines have taken place since 1927. In Durham considerable changes took place in C/O and E/O in the first period with lesser changes in S/O, and from 1927, C/O has increased slightly, E/O shows a decrease and then an increase, and S/O a decline. Northumberland exhibits the same features as Durham in the first period under review, and from 1927 shows declines in all three of C/O, E/O, S/O. These changes having been noted, we may seek adequate explanations of them. Broadly, we may explain these changes by indicating the obvious fact that just as demand fluctuates between summer and winter, so demand changes from one time to another. Roughly speaking, 1923, the year of the Ruhr Occupation, was a boom year in the Coal Industry;

\* The number of mechanical aids to production, such as coal-cutting machines, is not included here, because changes in these are likely to be of a gradual nature over a number of years.

1928 was a poor year. But such an explanation is not sufficient, we feel that we ought to be able, somehow, to reconstruct some of the links connecting the changes in demand with consequent changes made in the number of Labour units necessary to produce unit Output in response to this demand. We could visualize some of the connecting links between the changes in demand from winter to summer and the consequent up-and-down movements in C/O, E/O, S/O, when we considered the fact that maintenance work is continually in operation, and we can eliminate this seasonal movement from our data by considering, instead of quarterly figures, yearly figures, and contemplate a whole year's labour producing a whole year's Output. But when we turn to a study of the movements taking place over a longer period than a year we realize that we must look further for an explanation. When we read our daily newspaper, from time to time we see that such and such a Colliery has ceased operating, with a resultant loss of work to a number of men, or that such and such a Colliery has resumed the winding of coal. We must now consider the problem of finding the connecting links in more detail, taking into account the number of men employed and the length of time they are employed. In order to do this properly over the periods under review we must eliminate the seasonal character of the changes which we are dealing with, so that these seasonal movements will not complicate our problem, as they have their own special characteristics such as those indicated above. The seasonal movements might be eliminated by taking annual figures instead of quarterly figures, but the disadvantage of this method of procedure is that in the comparatively short periods for which we have comparable data, quite considerable secular changes were taking place, owing to the boom in 1923 and relative depression in 1928, and some part of these gradual changes would be masked in consequence. It is better for the purpose of eliminating the seasonal movements that we should retain quarterly figures, and use the method of moving averages. In this way, we take averages of four successive quarters' figures, irrespective of whether the four quarters make up a calendar year or not (after all, a calendar year is merely a conventional period of time, unrelated to the production of fuel), and retain the gradual changes which in fact are taking place from quarter to quarter.

It is preferable to consider first the movements taking place in C, E, S, O, that is, in the number of man-shifts worked and in the Output, rather than the movements in C/O, E/O, S/O, because the causes, whose effects we wish to observe, operate by changing C, E and S and ultimately O; C/O, E/O, S/O are merely secondary statistics worked out by a statistician from the original data. As

we stated above, the Industry responds to changes in demand, by changing the number of mines at work, the number of days the



Graphs showing relationship between Average Number of Shifts worked per worker (D) and Average Number of Days the mines wound coal (D') per quarter-year.

DIAGRAM 7.

mines wind coal, the number of men employed, and by changes in technique. Of these, details respecting the men are available in the Quarterly Statistical Summaries, and details of the coal-winding days

are available in the Annual Reports. Now the Annual Reports and the Statistical Summaries, as has been mentioned previously, do not cover exactly the same ground, but from the Statistical Summaries we can work out the average number of shifts worked per worker per quarter, which bears a close relationship to the average number of days the mines wind coal. We would not anticipate that these two sets of figures would be exactly the same, first, because they are derived from slightly different sources, and, second, because the average number of shifts worked per worker is obtained from the total number of man-shifts actually worked divided by the average number of workers, and on any occasion when the mine is working, all the man-shifts which might be worked are not in fact worked, on account of absenteeism due to illness, accident or any other cause. But it is reasonable to suppose that in the main the average number of man-shifts worked alters when the number of days the mines wind coal alters, and in the same way. The fact that this is so, is shown in Diagram 7. Consequently when we observe movements in the average number of shifts worked, we will suppose these to be broadly synonymous with movements in the average number of days the mines wind coal.

The information respecting the number of mines at work is obtainable annually for the whole Industry, district by district, from the Annual Reports, and so will not be dealt with here in conjunction with the other quarterly figures. In our research back from the Output, through the number of man-shifts worked, to the changes in demand, it is obvious that the number of men employed and their opportunities for employment are characters which should be considered as connecting links, and we may console ourselves a little for the lack of more detailed information of the number of mines working when we realize that this factor naturally plays a part in determining the number of men working. It is reasonable for us to suppose that changes in the number of men employed and the number of days the mines work will induce changes in the number of man-shifts worked, and therefore changes in the Output. Consequently we shall feel that we have further simplified our problem if we consider changes in these new factors now introduced :—number of men and days worked. We may now examine the statistical data available. These are shown for convenience in a graphical form below, Diagrams 8 to 19, district by district for the two periods, end 1921 to beginning 1926 and 1927 to 1930. In each case there are six series : the average number of shifts worked (D), the number of men employed (W), C, E, S and O. Again, for the convenience of making comparisons, logarithmic scales have been chosen. This method of choosing the scales enables us easily to make a direct comparison of relative changes in the six series.



The dotted lines indicate the general trends obtained as a result of the operation of the method of moving averages, four successive quarters being averaged successively.

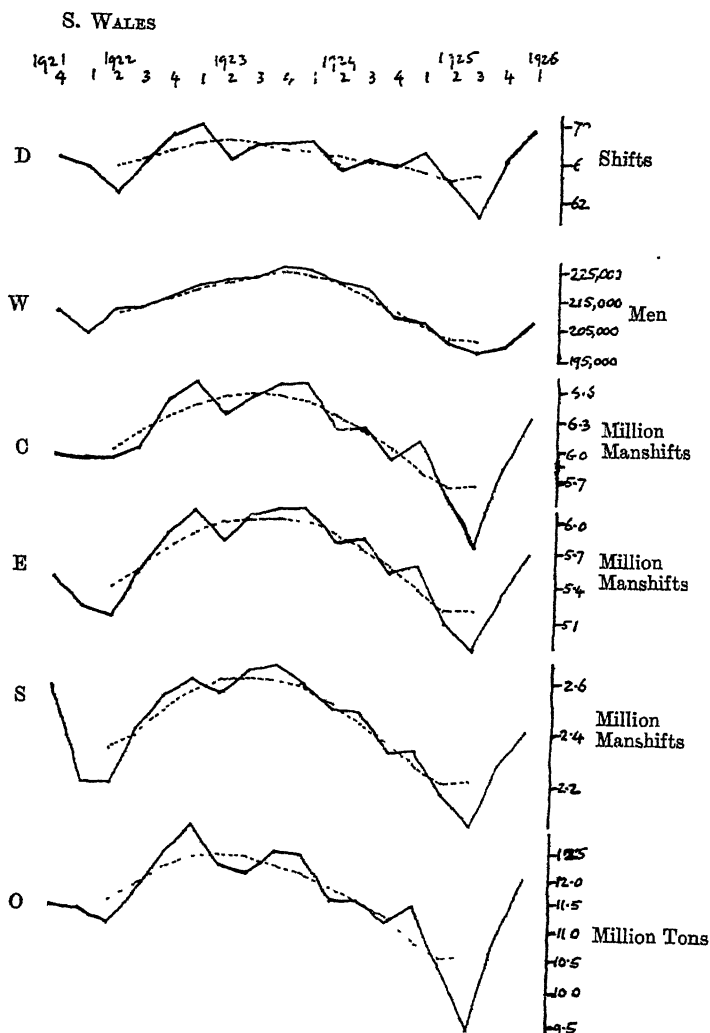


DIAGRAM 8.

These diagrams demonstrate forcibly the seasonal movement inherent in these series. This seasonal movement is most manifest in Scotland, Lancashire and the Midlands, and to a lesser extent in S. Wales, Durham and Northumberland. Further, the seasonal

movement in D is pronounced, but the movement in W is not so regular. For the most part it is the seasonal movement in D which

## S. WALES

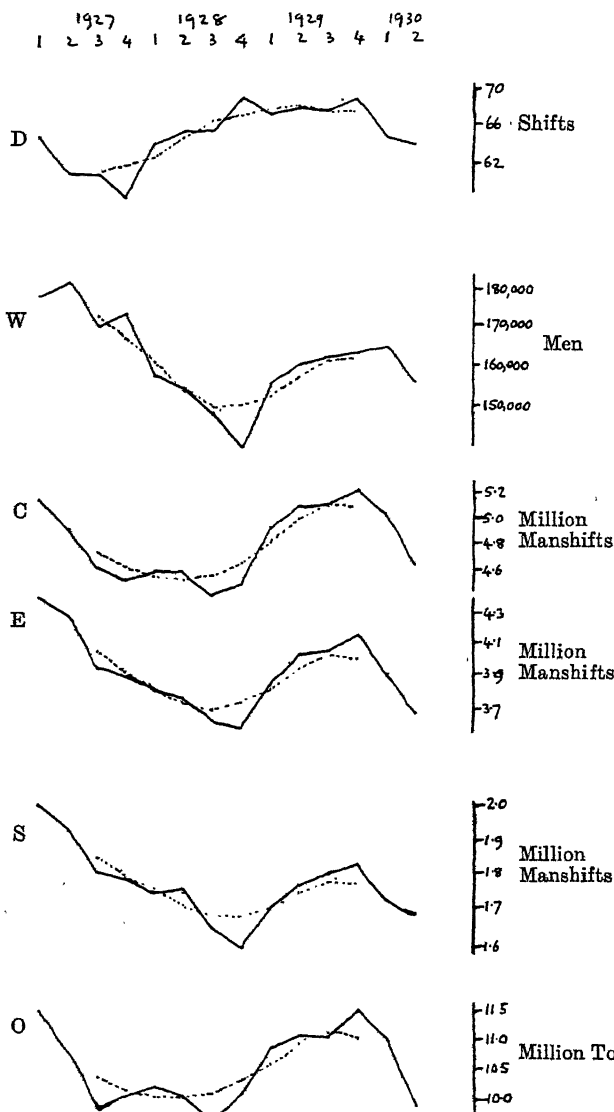


DIAGRAM 9.

produces the seasonal movement in C, E and S, with a resulting movement of like nature in O. Further, the extent of the seasonal

## SCOTLAND

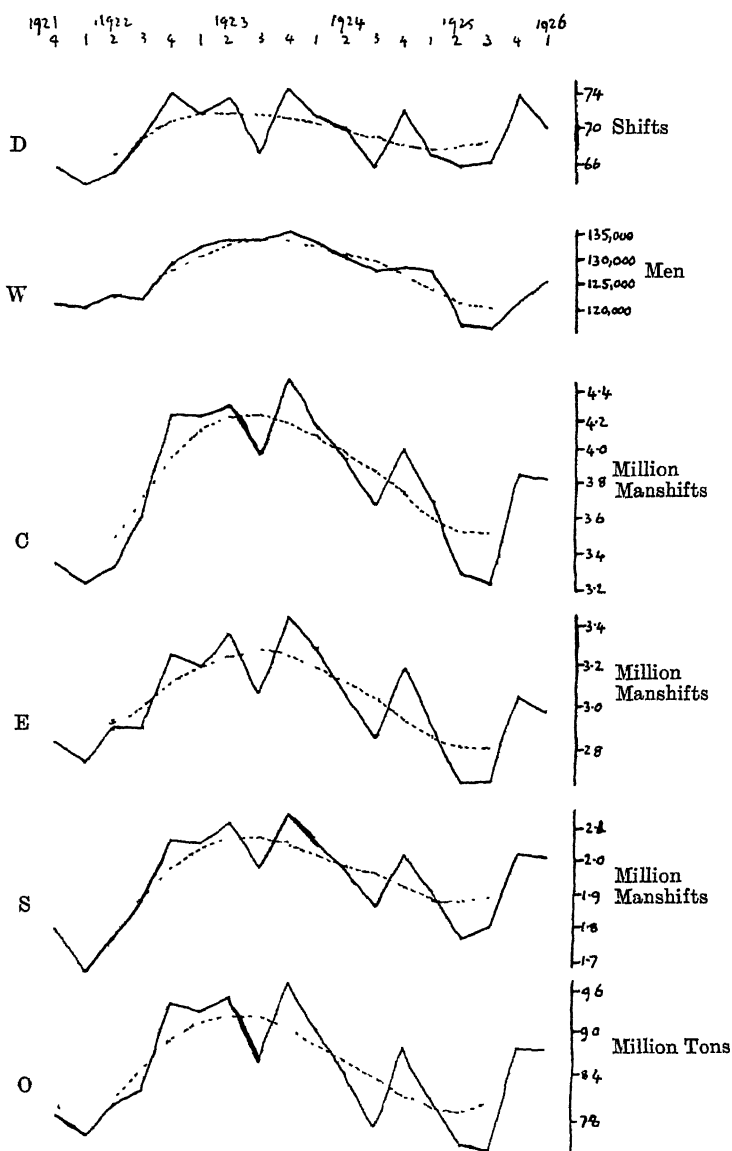


DIAGRAM 10.

movement is most pronounced in O, less pronounced in C, still less pronounced in E and still less in S, and it is on account of this fact that C/O, E/O, S/O have, as we saw, themselves a pronounced

seasonal movement. It is apparent from these diagrams that the temporary fluctuations in demand, which we have referred to as seasonal, are met for the most part by changing *D*, the average number of shifts worked per worker, *i.e.* by changing the number of days the mines wind coal, *i.e.* by altering the opportunities of the

## SCOTLAND

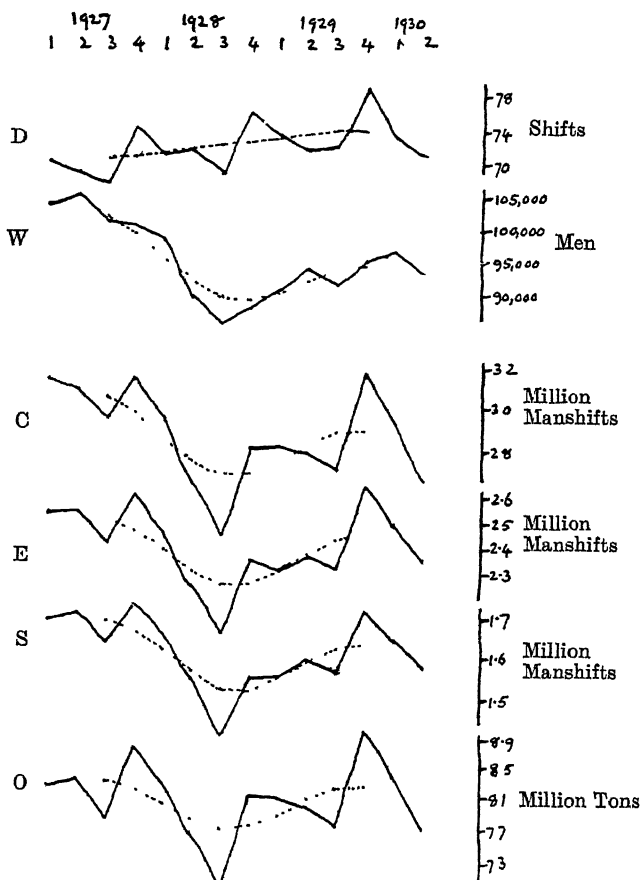


DIAGRAM 11.

men to produce. These changes in the number of days winding coal do not bring about the same relative changes in the man-shifts worked at the Coal-face, elsewhere below ground and above ground, but operate to produce a higher relative change at the Coal-face than elsewhere below ground, and a still lower relative change on the surface, due partly to the factors already considered under the general

heading of the maintenance of the mine, and these different relative changes produce a still greater relative change in Output. When

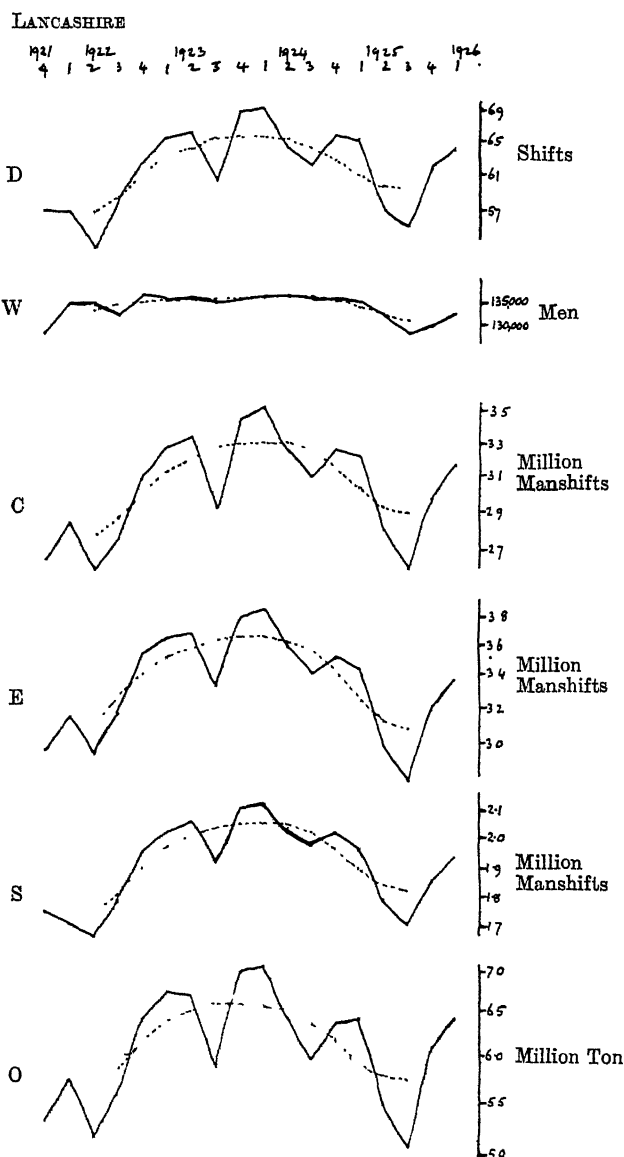


DIAGRAM 12.

we consider the secular changes which take place during the whole of the periods under review, we see that both D and W alter in most

## LANCASHIRE

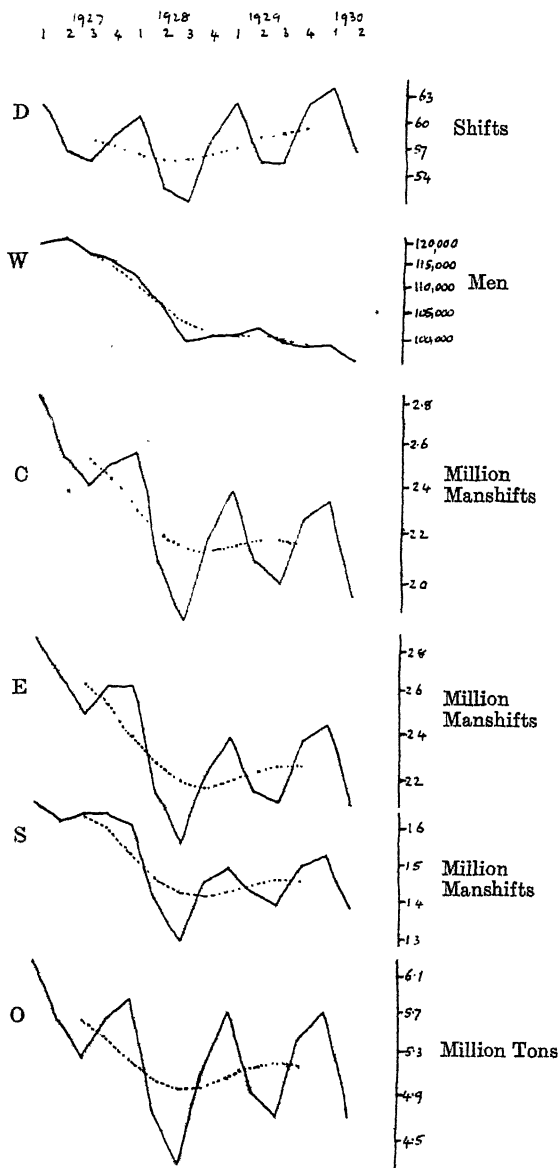


DIAGRAM 13.

cases materially, producing resultant changes in C, E, S with consequent changes in O. First, we would point out the parallelism between the general trends of C, E, S, and O in S. Wales, Scotland,

## MIDLANDS

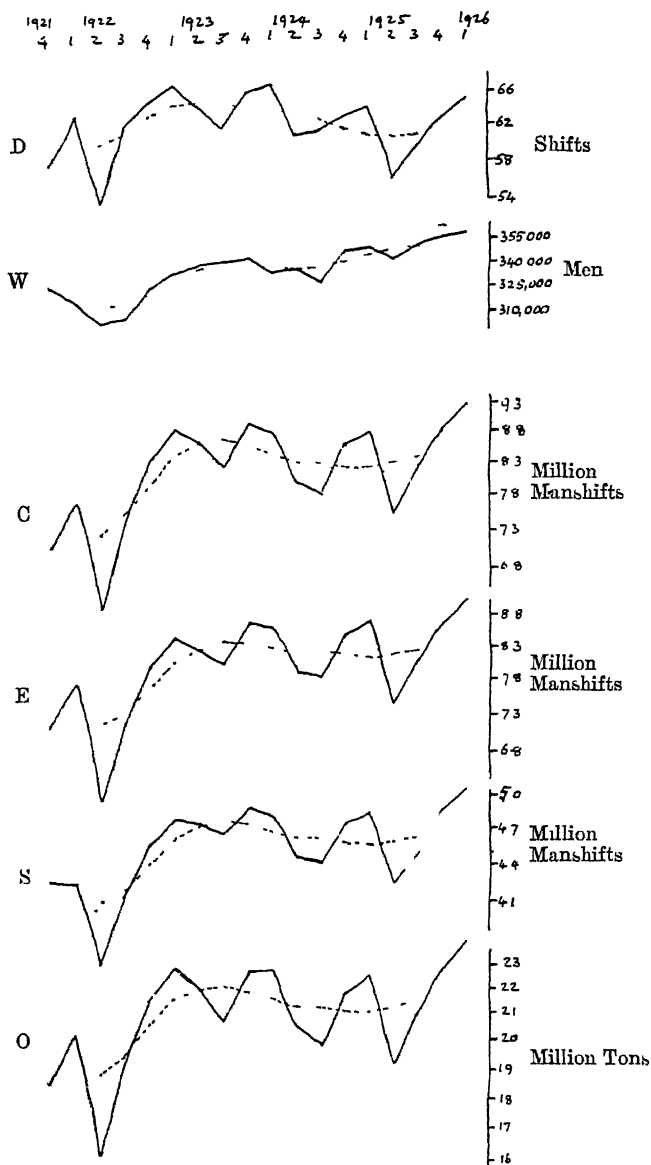


DIAGRAM 14.

Lancashire, Midlands, and Durham and Northumberland after 1927, and the dissimilar movement in C from the others in Durham before 1926, and the dissimilar movements in C and E in Northumberland

before 1926 The changes in D and W also should be noted, in some cases moving reasonably together, in other cases changing in different

## MIDLANDS

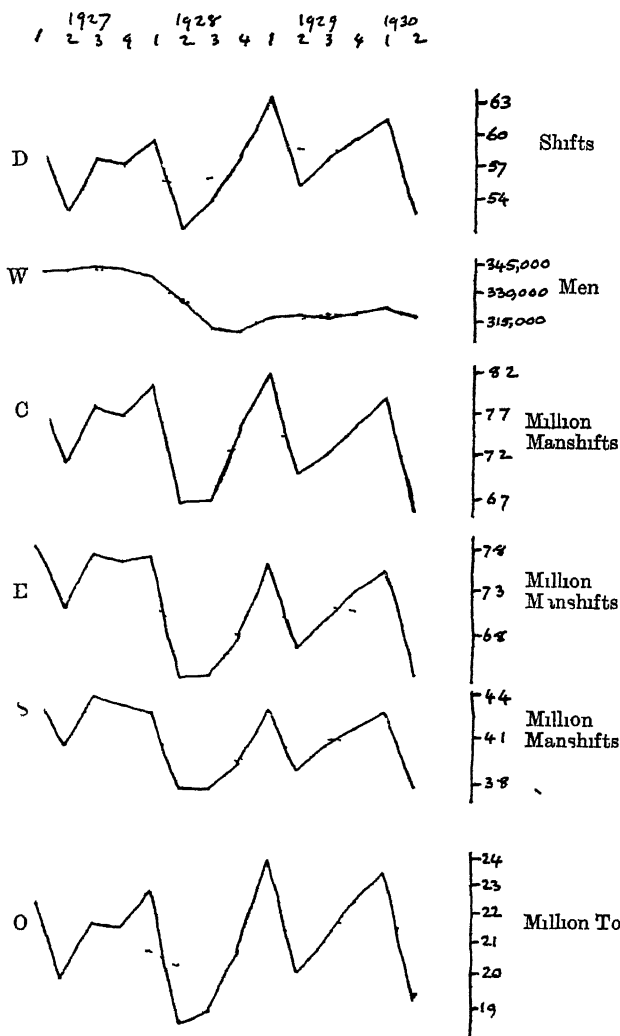


DIAGRAM 15.

ways Especially there should be noted the fact that from 1921 to 1926 the number of men employed in Lancashire apparently varied very little



## DURHAM

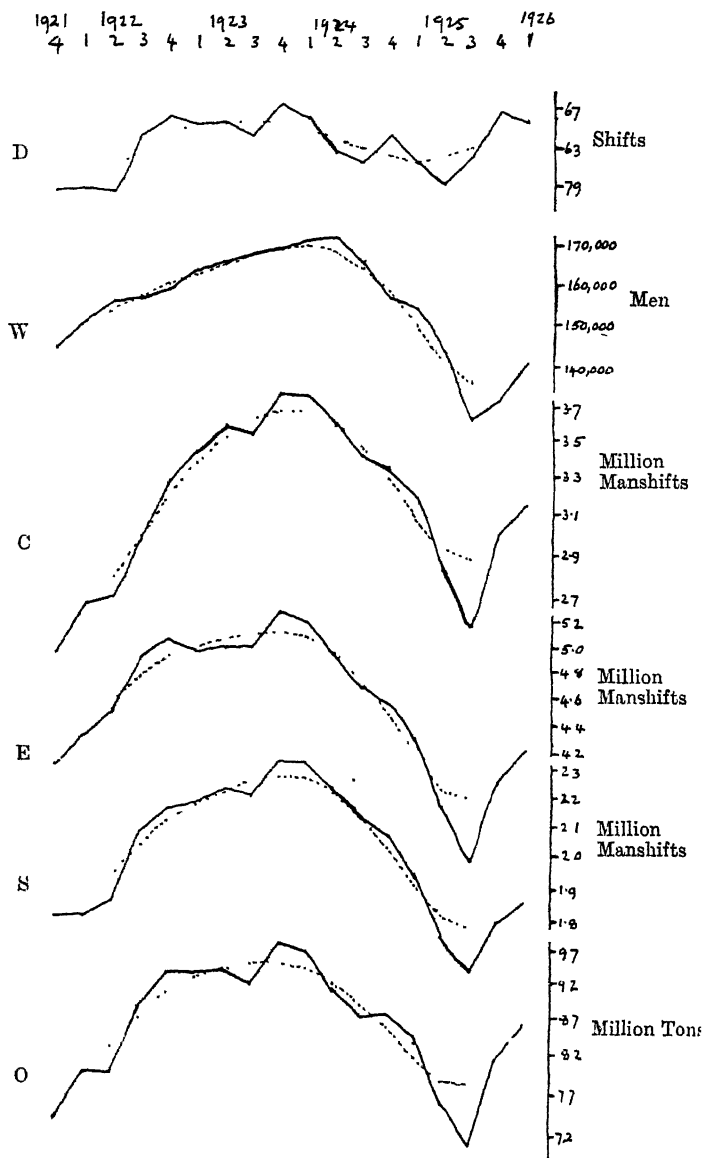


DIAGRAM 16.

4. *Days worked, Men working and Output.*

Let us now examine in some detail the changes which are made in the long run in D, W and O. In order to do this we deal with the

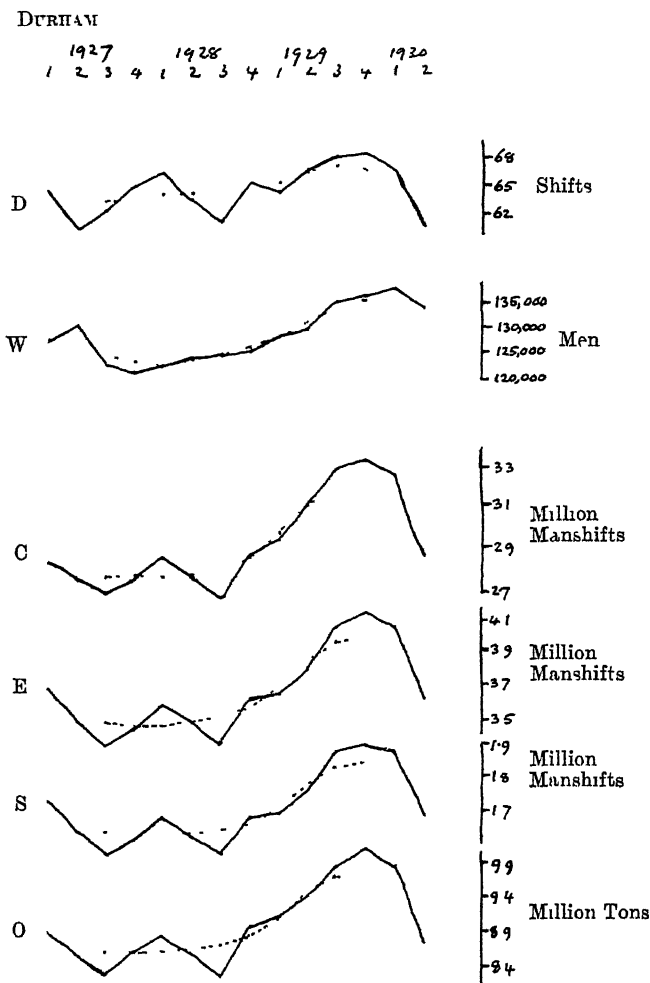


DIAGRAM 17.

trends of these series, using the moving average figures. It is best for a proper examination of the changes taking place to depart from the units involved in each case and to take relative figures. We propose, therefore, to obtain for each figure in a series its excess over the minimum figure in the series, and then express this excess as a

## NORTHUMBERLAND

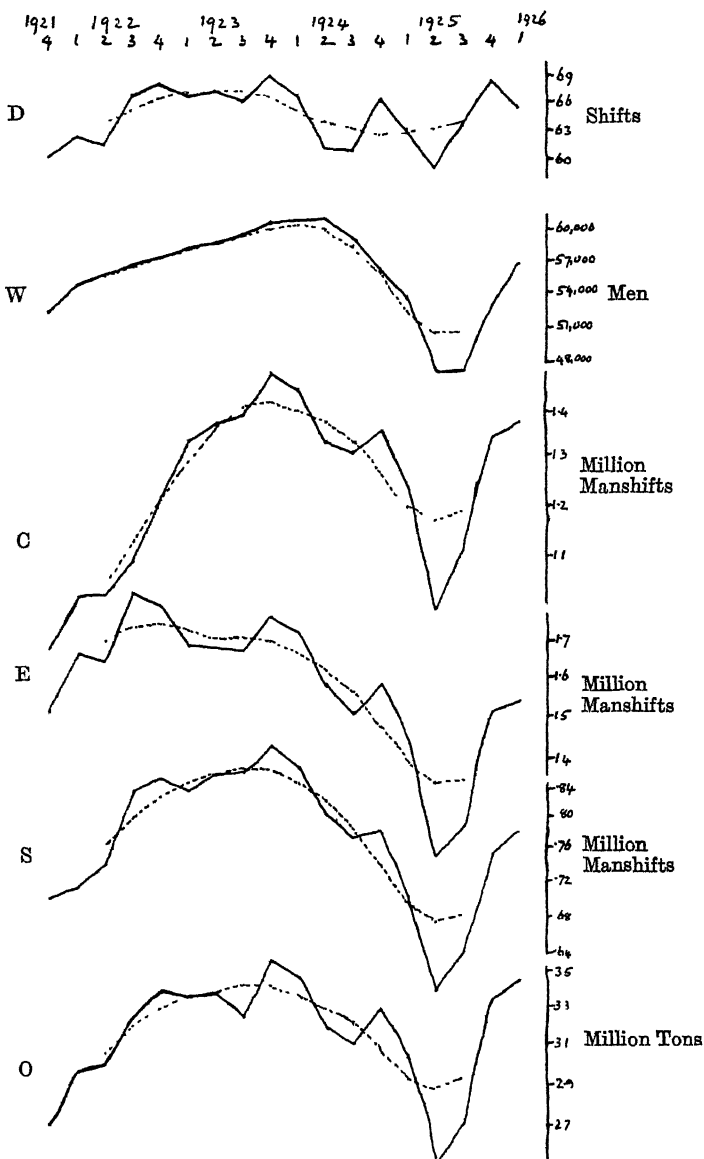


DIAGRAM 18.

percentage of the maximum excess. In this way we reduce the series for D, W and O to percentage figures which may be represented

graphically on the same scale. This procedure has been adopted, and there result the figures in the Appendix, Tables I to VI, column-headed Percentage changes of Maximum changes.

These figures are those plotted in the accompanying Diagram 20

#### NORTHUMBERLAND

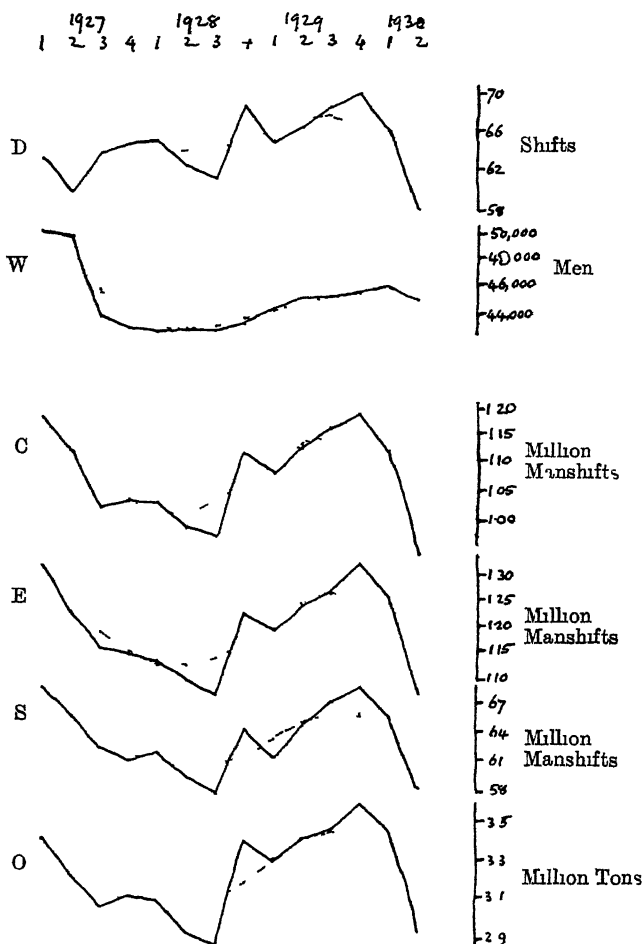
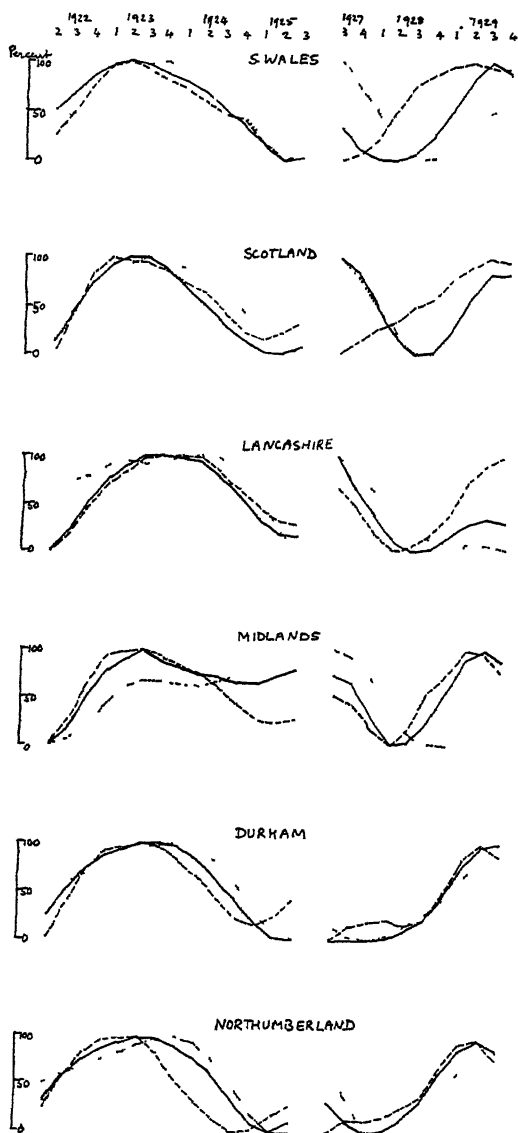


DIAGRAM 19

An examination of these diagrams reveals several points of interest. Chiefly, the most important fact emerges that D and W vary in different ways, the changes in them not being always of the same nature, thus sometimes D is increasing while W increases, sometimes D decreases while W increases, sometimes D



Diagrams showing changes in D (broken line), W (dotted line) and O (continuous line).

DIAGRAM 20.

increases while W decreases, and sometimes D and W decrease together. It is important from our point of view that the periods

covered by our statistics are periods of widely varying demand for coal, and we can see how changes were made in D and W in response to these changes. On the whole, there appears to be evidence that the same sort of changes take place in W as in D, but at a later date. W lags behind D. When there is increasing demand, this is first met by increasing the number of winding days, and later by increasing the number of men employed. Later, the number of winding days begins to diminish while the number of men is still increasing, and after, the number of men begins to decrease also, until the number of winding days begins to increase, while the number of men is still decreasing. The number of men reaches a minimum and then begins to increase, and the process appears to be continued. Further, there appears to be some evidence that the Output curve lags behind the D curve and the W curve lags behind the O curve. This tendency is visible in the cases of S. Wales (from 1923), Midlands, Durham and Northumberland, Lancashire (before 1923 and after 1926), Scotland (in part only). The tendency described appears to be of the nature shown below :—



This method of operation is not surprising. The Coal Industry is in the habit of meeting seasonal changes in demand by changing the number of coal-winding days, and naturally when a secular change in demand sets in, the first response is by the mechanism of days worked; later, when it is apparent that there is a definite tendency for increase of Output, more men are engaged, either by increasing the numbers at mines already working or by restarting mines which had been out of operation. Further, when the first signs are visible that the stage of over-production is being reached, the number of coal-winding days is diminished, and it is only after the fact has been appreciated that the boom has passed, that the number of men is reduced, by stopping work completely at certain mines or by curtailing the number of men working at others, closing down the less remunerative districts. The important point for us to realize is that these changes have their effect on the working results as indicated by the number of man-shifts necessary to produce unit Output, and it is undoubtedly the fact that changes of this kind take place, which produce the alterations in C/O, E/O, S/O to which we

called attention in the first place. We know that individual mines have their own peculiarities, that some can produce coal at a less cost in Labour units than others, and naturally any change in the constitution of the number of mines at work will cause a change in the average working results. Further, we have seen that the number of coal-winding days has an effect on the working results; from the original diagrams of C/O, E/O, S/O we saw that these were lower in winter than in summer, and on the average coal is wound more days in winter than in summer. Consequently, we can never use statistics relating to the whole Industry to assert that there is greater or less efficiency in the production of coal, without going into the question whether, at two dates to be compared, the same mines exactly are working the same number of days. At a boom period, it is likely that the mines working would include a number of relatively inefficient mines, or mines working districts which give relatively poorer returns for labour expended, which would tend to increase the working results C/O, E/O S/O, although the number of days worked would be large, which would tend to counteract this increase; whereas in a period of depression, the relatively inefficient mines, or districts in mines, would not be working and C/O, E/O, S/O would tend to be lower; on the other hand, the number of days worked would perhaps be low, and this would cause an increase in C/O, E/O, S/O. During the whole period between boom and depression the working results in a particular mine may have remained the same or have changed for the better or worse, but whatever is happening in a particular mine would be masked by changes in the constitution of the mines working or the days worked, or both, when figures for the whole Industry are examined.

### 5. *Analysis of Relationship of Output and Man-shifts to Men and Days.*

The figures indicating the changes with time in D, W, C, E, S, O will bear more detailed examination. So far we have merely examined the general features of the changes in the first two and the last. Now, upon reflection, it is evident that, since the changes in D and W are contributory to the changes in C, E and S, and through them to changes in O, there must be functional relationships which will express C, E, S and O in terms of D and W. But, before we proceed with this matter any further we must remember that another factor enters into the determination of the Labour units worked and the Output; we refer to the increase of technical methods of getting and handling coal, the use of mechanical coal-cutters and the like, and to the changing difficulty of winning coal at a seam. We can only at the moment refer to this factor as the time element, and

envisage the possibility that as time goes on C, E, S and O may change irrespective of any changes in D and W due to such causes as those mentioned. So we feel that we ought to be able to find expressions involving D, W and  $t$  (time element), for each of C, E, S and O, which will reproduce for us the actual values of these variables, when we substitute appropriate values of D, W and  $t$ . Such expressions as these will be useful to us, because we can examine what changes will take place in C, E, S and O, and consequently in C/O, E/O, S/O, when each of D, W and  $t$  are allowed to vary independently of each other. These expressions will serve the purpose of allowing us to experiment, keeping control of our variable quantities, as a physicist can experiment in a laboratory. Unfortunately, there are no natural laws to which we can appeal which will enable us to determine, by *à priori* reasoning, what exactly will be the algebraic form of the expressions to which allusion has been made, and any results we achieve will be approximate, empirical and tentative, and we cannot stress too highly the importance of this fact. On the other hand, the expressions which are eventually discovered do serve the purpose intended, that is, they do reproduce with fair exactitude the original values of C, E, S and O when the appropriate substitutions are made, and lead us to conclusions which appear to be reasonable. But, of course, as is inevitable in work of this kind, other expressions of different form equally good from this point of view might be obtained, if the statistics were handled in a slightly different way, but it is likely that eventually the same general conclusions would be reached. With these remarks, we will pass to the method of obtaining the formulæ. As we have already stated, some of the diagrams illustrative of preceding parts of this paper have been on logarithmic scales, and in the analysis of the figures at this stage the logarithms of the original statistics have been used. The approximate formulæ which have been obtained are simple linear relationships expressing each of  $\log C$ ,  $\log E$ ,  $\log S$  and  $\log O$  in terms of  $\log D$ ,  $\log W$  and  $t$ , the numerical factors in these relationships having been obtained by the Method of Least Squares. As to the *method*, quite ordinary procedure familiar to statisticians has been followed; as to *results*, the success of the approximate formulæ is indicated in two ways: (1) directly in the Appendix, where the original figures are shown side by side with the *synthetic* figures obtained from the formulæ and where it will be seen that to three figures at any rate there is fair agreement; (2) graphically in Diagrams 1 to 6, with the original figures of C/O, E/O, S/O, where it will be seen that the values of C/O, E/O, S/O from the formulæ smooth out the seasonal fluctuations in the original figures with fair success; and as our main purpose consists in an examination of



Before 1926.		S. Wales.		After 1926.	
log C =	1-0650 log D + 0-8207 log W - 0-000412 t - 0-3552		1-5414 log D + 1-0825 log W - 0-000311 t - 0-7059		1-5414 log D + 1-0825 log W - 0-000311 t - 0-7059
log E =	1-0329 log D + 1-0257 log W + 0-000632 t - 0-4415		1-1299 log D + 1-0974 log W - 0-002418 t - 0-5410		1-1299 log D + 1-0974 log W - 0-002418 t - 0-5410
log S =	1-1701 log D + 1-0031 log W + 0-000044 t - 0-9089		0-4733 log D + 0-8327 log W - 0-001548 t - 0-3027		0-4733 log D + 0-8327 log W - 0-001548 t - 0-3027
log O =	1-6078 log D + 0-4534 log W - 0-001612 t - 1-3944		1-7059 log D + 1-0227 log W - 0-001697 t - 1-5686		1-7059 log D + 1-0227 log W - 0-001697 t - 1-5686
<i>Scotland.</i>					
log C =	1-2925 log D + 1-1687 log W + 0-000152 t - 0-6263		0-9882 log D + 1-0774 log W - 0-000374 t - 1-4445		0-9882 log D + 1-0774 log W - 0-000374 t - 1-4445
log E =	0-7022 log D + 0-9528 log W - 0-000790 t - 0-2031		0-8955 log D + 0-9897 log W + 0-000729 t - 1-3604		0-8955 log D + 0-9897 log W + 0-000729 t - 1-3604
log S =	1-2055 log D + 0-5041 log W + 0-000777 t - 0-7829		0-7062 log D + 0-9623 log W + 0-000186 t - 1-3409		0-7062 log D + 0-9623 log W + 0-000186 t - 1-3409
log O =	1-6381 log D + 0-3487 log W - 0-001382 t - 0-4740		1-2207 log D + 0-7451 log W + 0-000026 t - 0-8764		1-2207 log D + 0-7451 log W + 0-000026 t - 0-8764
<i>Lancashire.</i>					
log C =	0-9834 log D + 1-0814 log W + 0-000947 t - 0-4401		1-0321 log D + 0-9066 log W - 0-001226 t - 0-4459		1-0321 log D + 0-9066 log W - 0-001226 t - 0-4459
log E =	0-9615 log D + 1-3947 log W - 0-000837 t - 0-4079		1-1045 log D + 1-0971 log W + 0-000376 t - 0-4998		1-1045 log D + 1-0971 log W + 0-000376 t - 0-4998
log S =	0-9393 log D + 0-8187 log W + 0-000676 t - 0-5726		0-8807 log D + 0-8877 log W + 0-000499 t - 0-5191		0-8807 log D + 0-8877 log W + 0-000499 t - 0-5191
log O =	1-3010 log D - 0-1845 log W - 0-001253 t - 0-2112		1-2795 log D + 0-4941 log W - 0-000995 t - 0-2620		1-2795 log D + 0-4941 log W - 0-000995 t - 0-2620
<i>Midlands.</i>					
log C =	1-0599 log D + 1-1808 log W - 0-000931 t - 0-5391		1-0033 log D + 0-4314 log W - 0-001332 t - 0-1035		1-0033 log D + 0-4314 log W - 0-001332 t - 0-1035
log E =	1-0059 log D + 0-7929 log W + 0-001196 t - 0-3155		1-1328 log D + 1-2925 log W + 0-000170 t - 0-6682		1-1328 log D + 1-2925 log W + 0-000170 t - 0-6682
log S =	0-9477 log D + 0-9802 log W - 0-000407 t - 0-8047		0-9500 log D + 0-9655 log W + 0-000382 t - 0-6047		0-9500 log D + 0-9655 log W + 0-000382 t - 0-6047
log O =	1-0281 log D + 1-0204 log W - 0-000647 t - 1-2024		1-2577 log D + 0-6067 log W + 0-001403 t - 0-9466		1-2577 log D + 0-6067 log W + 0-001403 t - 0-9466
<i>Durham.</i>					
log C =	1-3900 log D + 1-1496 log W + 0-004106 t - 0-8593		1-3090 log D + 1-0110 log W + 0-000014 t - 0-7036		1-3090 log D + 1-0110 log W + 0-000014 t - 0-7036
log E =	0-8171 log D + 0-9093 log W - 0-002791 t - 0-1456		0-8717 log D + 1-0824 log W - 0-000053 t - 0-2596		0-8717 log D + 1-0824 log W - 0-000053 t - 0-2596
log S =	0-8979 log D + 0-9798 log W + 0-000081 t - 0-5986		0-8232 log D + 0-9778 log W - 0-000610 t - 0-5374		0-8232 log D + 0-9778 log W - 0-000610 t - 0-5374
log O =	1-0842 log D + 0-6516 log W - 0-000631 t - 0-0507		1-0327 log D + 0-8407 log W + 0-000303 t - 0-0241		1-0327 log D + 0-8407 log W + 0-000303 t - 0-0241
<i>Northumberland.</i>					
log C =	1-5493 log D + 1-4077 log W + 0-008616 t - 2-2764		1-2088 log D + 0-9310 log W - 0-000176 t - 1-5541		1-2088 log D + 0-9310 log W - 0-000176 t - 1-5541
log E =	0-5500 log D + 0-6833 log W - 0-006051 t - 0-6891		1-0188 log D + 1-0696 log W + 0-000180 t - 1-4482		1-0188 log D + 1-0696 log W + 0-000180 t - 1-4482
log S =	1-2976 log D + 0-9653 log W - 0-000834 t - 0-8729		0-6333 log D + 0-9895 log W - 0-000065 t - 0-3565		0-6333 log D + 0-9895 log W - 0-000065 t - 0-3565
log O =	0-9761 log D + 0-6848 log W + 0-000530 t - 0-8072		1-3777 log D + 0-8847 log W + 0-000086 t - 1-1906		1-3777 log D + 0-8847 log W + 0-000086 t - 1-1906

Before 1926.			<i>S. Wales.</i>			After 1926.		
log C/O =	-	0.5422 log D	+	0.3673 log W	+	0.001200 t	+	1.0392
log E/O =	-	0.5749 log D	+	0.5723 log W	+	0.002244 t	+	0.6529
log S/O =	-	0.4377 log D	+	0.5497 log W	+	0.001050 t	+	0.4855
<i>Scotland.</i>								
log C/O =	-	0.3456 log D	+	0.8200 log W	+	0.001534 t	-	0.1523
log E/O =	-	0.9359 log D	+	0.6041 log W	+	0.000592 t	+	0.2709
log S/O =	-	0.4326 log D	+	0.1554 log W	+	0.002159 t	-	0.3089
<i>Lancashire.</i>								
log C/O =	-	0.3176 log D	+	1.2659 log W	+	0.002300 t	-	0.2389
log E/O =	-	0.3305 log D	+	1.5792 log W	+	0.000416 t	-	0.1967
log S/O =	-	0.3617 log D	+	1.0032 log W	+	0.001929 t	-	0.3614
<i>Midlands.</i>								
log C/O =	+	0.0319 log D	+	0.1604 log W	-	0.000284 t	+	0.4933
log E/O =	-	0.0222 log D	-	0.2275 log W	+	0.001843 t	+	0.7039
log S/O =	-	0.0804 log D	-	0.0402 log W	+	0.000240 t	+	0.4177
<i>Durham.</i>								
log C/O =	+	0.3148 log D	+	0.4980 log W	+	0.004737 t	-	0.8086
log E/O =	-	0.2671 log D	+	0.2577 log W	-	0.002160 t	-	0.0949
log S/O =	-	0.1893 log D	+	0.3281 log W	+	0.000712 t	-	0.5479
<i>Northumberland.</i>								
log C/O =	+	0.5732 log D	+	0.7229 log W	+	0.008086 t	-	1.4692
log E/O =	-	0.4261 log D	-	0.0315 log W	-	0.006581 t	+	0.1181
log S/O =	+	0.3215 log D	+	0.2803 log W	-	0.001364 t	-	0.0637

In these formulæ the mantissæ only of the logarithms are entered.

working results, the real test is whether our formulæ reproduce the general tendencies in C/O, E/O and S/O, and in this they undoubtedly succeed. The formulæ obtained are given here, and are accompanied by formulæ derived from them giving C/O, E/O, S/O in terms of D, W and  $t$ . The time element  $t$  is measured from 1922, first quarter, in the formulæ referring to the period before the 1926 stoppage, and from 1927, second quarter, in the formulæ referring to the period after the 1926 stoppage, and in all cases the unit of time is a quarter of a year.

## 6. *Discussion of Results of Analysis.*

The most important fact which emerges from a study of the formulæ connecting C/O, E/O, S/O with D, W and  $t$  is that the signs of the multipliers of log D are mostly negative, and those of the multipliers of log W are mostly positive. This means that, when we consider the possibility of W and  $t$  remaining the same, and increasing D in order to increase the Output, C/O, E/O, S/O decrease; that is, there is improvement in working results. Similarly, if we consider D and  $t$  remaining constant, the increasing of W in order to increase the Output will increase C/O, E/O, S/O; that is, there is deterioration in the working results. Thus, at any given time, if it is desired that the Output should be increased, this increase is more efficiently obtained by increasing the number of days worked, rather than by increasing the number of men at work. It must be remembered, however, that we are dealing here with figures relating to the whole Industry, and particular figures for individual mines are not available, and the changes referred to above might be produced in a variety of ways, by changes in the mines operating. For instance, if the total number of men working remains the same, we saw that an increase in the average number of coal-winding days was accompanied by an increase in the total Output with better average working results. This might mean that better working results were achieved at every individual mine, that the increase in number of man-shifts worked was accompanied by a relatively greater increase in the Output at each mine. On the other hand, such a change might quite conceivably be due to an increase in the number of days worked at the more efficient mines and a decrease in the number of days worked at the less efficient mines, without the working results being changed at any individual mine. For instance, suppose we take the case of two mines both employing 1,000 men, all working 70 days in a quarter, giving 70,000 man-shifts worked in each. Suppose the first mine produces 77,000 tons and the second 63,000 tons. The average number of days worked is 70, the working result is, for both,  $\frac{140,000}{140,000}$  man-shifts

per ton, *i.e.* 1 man-shift per ton. Now suppose, instead, that the first mine works 75 days and the second 68 days in the quarter. The total man-shifts worked is 75,000 plus 68,000, *i.e.* 143,000, giving an average of days worked  $71\frac{1}{2}$ . If the working results of each mine are the same on both occasions, the Output at the first mine is now 75,000 multiplied by 1.1, *i.e.* 82,500 tons, and at the second mine 68,000 multiplied by .9, *i.e.* 61,200 tons, giving a total Output of 143,700 tons. The average working result for both mines together is  $\frac{143,000}{143,700}$  man-shifts per ton, *i.e.* a decrease from 1 man-shift per ton before the change was made. Alternatively, changes of this kind might be due to changes in both the number of men working and the number of days worked at the pits, the working results at individual mines being unaltered. For instance, the number of men might be decreased and the number of days worked increased in the more efficient mines, while the number of men might be increased and the number of days worked decreased in the less efficient mines. Such a change might result in an increase in the average number of days worked in the Industry as a whole, with an increased Output with better working results. The point is, that we cannot jump from conclusions which relate to figures for the whole Industry, to infer what is happening in particular mines. On the other hand, it would be interesting to know, from data collected by individual mines, whether these conclusions which we have obtained for the whole Industry apply to them also, or whether these changes in working results are due to a shifting of the Output produced from one mine to another, *i.e.* due to a shuffling of the shares in the Output of different mines.

Let us consider these equations from another point of view. We can illustrate this point by considering the equations referring to S. Wales before 1926. In this case the equation giving  $O$  in terms of  $D$ ,  $W$  and  $t$  implies that at a given time the same Output is produced with varying  $D$  and  $W$  so long as the variations in these are connected in a certain way; for instance, we might have a relative increase in  $D$  accompanied by a corresponding relative decrease in  $W$ . But if we allow such a change to take place the equations for  $C/O$ ,  $E/O$ ,  $S/O$  inform us that there will be an improvement in working results, because the sign of  $\log D$  in these equations is negative and that of  $\log W$  is positive. Thus we infer that an Output of given size is produced most efficiently when  $D$  is as large as possible and  $W$  as small as possible consistent with producing this Output. This means that the best working results are achieved if a minimum number of men work as large a number of days as is possible in a quarter. This result is obtained when the equations referring to S. Wales (both

periods), Scotland (both periods), Lancashire (period after 1926 stoppage), Midlands (period after 1926 stoppage), Durham (both periods), Northumberland (both periods) are examined. So that theoretically it appears that the most efficient method of producing Output of changing volume would be to have the Industry organized in such a way that there was a constant high average number of days worked, with a changing number of men employed, these changes being made in response to changes in demand. Contrast this theoretical ideal with the facts relating to Lancashire before 1926, when practically the number of men employed was unaltered for two and a half years and the changes in Output were induced by changes in the number of days worked. Actually, as we have seen, on the whole, changes in Output are first obtained by changing the number of days worked, and later by changing the number of men employed.

Before leaving the consideration of these equations, we must discuss the place occupied in them by the time element *t*. As we mentioned previously, we expected that *t* would indicate variations due to changing conditions of workings, difficulties of getting coal, technical improvements and so on. We can, by supposing D and W to remain the same, indicate the changes in working results due to these causes in the periods under review. These are set out below :—

*Percentage Annual Changes in Working Results.*

			Before 1926.	After 1926.	Before 1926.	After 1926.
			<i>S. Wales.</i>		<i>Scotland.</i>	
C/O	...	...	+1.1	+1.3	+1.4	-0.4
E/O	...	...	+2.1	-0.6	+0.6	+0.6
S/O	...	...	+1.5	+0.1	+2.0	+0.1
			<i>Lancashire.</i>		<i>Midlands.</i>	
C/O	...	...	+2.0	-0.2	-0.3	-2.5
E/O	...	...	+0.4	+1.3	+1.7	-1.1
S/O	...	...	+1.8	+1.4	+0.2	-0.9
			<i>Durham.</i>		<i>Northumberland.</i>	
C/O	...	...	+4.4	-0.3	+7.7	-0.8
E/O	...	...	-2.0	-0.3	-6.2	-0.5
S/O	...	...	+0.6	-0.8	-1.3	-0.7

The plus sign indicates that from one year to the next there is a relative increase in working results, *i.e.* more Labour units are required in the production of unit Output, while a negative sign indicates from one year to the next a smaller number of Labour units necessary for the production of unit Output. Before 1926, coal was being produced at greater expense of labour as time went on in S. Wales, Scotland, Lancashire in all departments; but in the Midlands better results were being obtained at the Coal-face, with worse results elsewhere below ground and on the surface; in Durham there was

deterioration in working results at the Coal-face and on the surface, but improvement elsewhere below ground; and finally, in Northumberland there was deterioration at the Coal-face with improvement in other departments. After 1926, on the other hand, there was more improvement than deterioration. In S. Wales, the working results at the Coal-face and on the surface gradually became worse, but there was improvement elsewhere below ground; in Scotland there was improvement at the Coal-face, but deterioration in other departments; in Lancashire the same, but in the Midlands, Durham and Northumberland areas there was progressive improvement.

These changes between the two periods under review are what might be expected owing to the fact that since the Coal Stoppage of 1926, fewer mines have been at work, and those remaining in the field of production are presumably those which produce more economically; also there has been a progressive increase in mechanical aids. These facts are indicated in the Appendix, Table VII.

#### 7. Comparison of Working Results before and after 1926.

We can in certain cases make a comparison of the working results before and after 1926 by substituting in the formulæ for C/O, E/O, S/O the same values of D and W. As these formulæ only pretend to represent in a compact form what has been happening in these periods, it would not be right to expect them to describe what might have happened if the values of D and W were very different from the values of these which then obtained. Consequently, if we are to use these formulæ to make a comparison between the two periods, we are only entitled to substitute values of D and W reasonably within the limits of those actually experienced. These considerations rule out the possibility of making comparisons in the cases of all districts except the Midlands and Durham.

The table below gives the limits of variation of D and W in the two periods, see Appendix, Tables I to VI.

				Before 1926.	After 1926.
<i>S. Wales.</i>	D ... ..	...	...	64.4-68.3	61.4-68.0
	W (000)	...	...	201-224	150-173
<i>Scotland.</i>	D ... ..	...	...	66.8-71.4	70.9-74.1
	W (000)	...	...	120-134	90-103
<i>Lancashire.</i>	D ... ..	...	...	57.1-65.9	55.7-59.1
	W (000)	...	...	131-137	99-117
<i>Midlands.</i>	D ... ..	...	...	59.3-64.3	55.5-58.7
	W (000)	...	...	310-350	315-343
<i>Durham.</i>	D ... ..	...	...	60.7-65.5	63.2-67.1
	W (000)	...	...	137-170	122-136
<i>Northumberland.</i>	D ... ..	...	...	62.4-67.0	63.3-67.7
	W (000)	...	...	50-60	43-46

These ranges do not overlap or approach one another in the two periods except in the case of the Midlands and Durham. In the case of the Midlands we shall probably get reasonably comparable results if we substitute in the formulæ for C/O, E/O, S/O, for both periods,  $D = 58.9$  and  $W = 316,000$  or  $W = 339,000$ . If at the same time we take  $t = 14$  when substituting in the formulæ applicable to the first period, and  $t = 1$  in those applicable to the second period, we shall eliminate as far as possible the time effect. When these substitutions are made we get the following :—

$W = 316,000.$	$\frac{C/O \text{ (after 1926)}}{C/O \text{ (before 1926)}}$	$= 0.918$ , a decrease of 8.2 per cent.			
	$\frac{E/O \text{ (after 1926)}}{E/O \text{ (before 1926)}}$	$= 0.841$ ,	„	15.9	„
	$\frac{S/O \text{ (after 1926)}}{S/O \text{ (before 1926)}}$	$= 0.879$ ,	„	12.1	„
$W = 339,000.$	$\frac{C/O \text{ (after 1926)}}{C/O \text{ (before 1926)}}$	$= 0.897$ ,	„	10.3	„
	$\frac{E/O \text{ (after 1926)}}{E/O \text{ (before 1926)}}$	$= 0.896$ ,	„	10.4	„
	$\frac{S/O \text{ (after 1926)}}{S/O \text{ (before 1926)}}$	$= 0.904$ ,	„	9.6	„

The improvement in working results is due mainly to the lengthening of hours after the 1926 stoppage. In this area a  $7\frac{1}{2}$ -hour shift has mostly been worked since that time, and we can calculate what would be the effect of the longer time on working results. The difficulty about the time actually worked arises. On the average over the whole area it might be conceded that a 7-hour shift means  $6\frac{1}{2}$  hours working time underground, but we can consider three possibilities, so that we might be on the safe side in making comparisons. If since 1926 working time increased from 6 hours to  $6\frac{1}{2}$  hours, this is equivalent to a decrease in working results of 8.3 per cent.; if working time increased from  $6\frac{1}{2}$  hours to 7 hours, this is equivalent to a decrease in working results of 7.7 per cent., and if working time increased from 7 hours to  $7\frac{1}{2}$  hours, this is equivalent to a decrease in working results of 7.1 per cent. Thus we may reasonably consider a decrease in working results of something like 7 to 8 per cent. as due to increasing the shift by half an hour. Now we find the actual improvement in working results is definitely greater than this amount, and must conclude that there has definitely been an improvement in working results due to more efficient working or to more efficient mines only producing.

In the case of Durham we can reasonably substitute in the equations for C/O, E/O, S/O for both periods,  $W = 136,000$  and  $D = 63.1$  or  $65.3$ , and  $t = 14$  in the formulæ applicable to the first

period, and  $t = 1$  in the formulæ applicable to the second period. When these substitutions are made we get the following :—

D = 63.1.	C/O (after 1926)	= 0.867, a decrease of 13.3 per cent.			
	C/O (before 1926)				
	E/O (after 1926)	= 0.839,   "   "   16.1   "			
	E/O (before 1926)				
	S/O (after 1926)	= 0.854,   "   "   14.6   "			
	S/O (before 1926)				
D = 65.3.	C/O (after 1926)	= 0.865,   "   "   13.5   "			
	C/O (before 1926)				
	E/O (after 1926)	= 0.842,   "   "   15.8   "			
	E/O (before 1926)				
	S/O (after 1926)	= 0.853,   "   "   14.7   "			
	S/O (before 1926)				

In Durham since the stoppage a  $7\frac{1}{2}$ -hour shift has been worked at the Coal-face and an 8-hour shift elsewhere. The lengthening of the shift by 1 hour is equivalent to a decrease in working results of 16.7 per cent. to 14.2 per cent., if we consider two extreme possibilities—working time increasing from 6 hours to 7 hours, or from 7 hours to 8 hours. The improvement in working results since the stoppage elsewhere below ground and on the surface is probably entirely accounted for by the lengthening of time, but the improvement at the Coal-face of about 13½ per cent. is much more than would be expected due to a lengthening of the shift by half an hour, and we must conclude that part of the improvement is due to definite improvement in efficiency generally, or to the more efficient mines being used for production.

### 8. Conclusion.

We have seen that the Output per worker in the Coal-mining Industry varies from time to time, and these variations are due to two causes : (i) the Organisation of the Industry for Production, and (ii) the changes which take place in natural difficulties of getting coal and in the technique of getting and handling coal. We have seen that in response to seasonal changes in demand the Organisation increases the number of days the mines wind coal, and this method appears from the figures analysed to be the best way of improving working results. On the other hand, when a continuously increasing demand exists, the Organisation responds by gradually increasing the number of men working in addition to increasing the days worked, and this method does not seem to be the best way of improving working results, and eventually, when the demand decreases, the resultant diminution in the number of men employed appears to be a slow process, which makes for poorer working results than would be



expected owing to the continued improvement taking place in technical methods. At any given time the working results depend largely upon the way production is divided up amongst the individual mines, and a change in Output per worker from one time to another may be mostly due to the fact that at the two periods the Output has been divided up amongst the mines in different proportions. Also it may be that at any given time a certain total Output might have been produced at a less Labour cost if the Output had been distributed over the mines working in a different manner from that actually in existence at the time.

## APPENDIX.

*Secular Trends and Calculations from Formulae.*

## I. S. Wales.

		Days.	Mon.	Man-shifts.						Output (tons).		Percentage Changes of Maximum Changes.		
				C(a)	C(b)	E(a)	E(b)	S(a)	S(b)	O(a)	O(b)	D	W	O
				(000)	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)			
1922	2	65.1	210	600	599	538	539	234	233	1,152	1,151	26.2	36.2	51.0
	3	66.3	212	617	614	554	555	239	239	1,183	1,180	49.5	48.1	67.5
	4	67.4	216	633	632	573	574	248	249	1,218	1,214	76.6	63.0	85.9
1923	1	64.2	219	645	646	589	590	256	255	1,239	1,240	96.4	75.6	96.9
	2	65.3	222	654	654	598	600	261	260	1,245	1,247	100	88.3	100
	3	67.0	224	656	655	602	603	262	260	1,230	1,237	90.8	97.5	96.0
	4	67.6	224	653	652	602	602	261	260	1,223	1,233	81.0	100	88.5
1924	1	67.2	224	647	646	599	599	258	257	1,207	1,206	71.5	97.9	80.0
	2	66.7	221	634	634	589	587	251	252	1,183	1,180	58.5	85.7	67.5
	3	66.3	217	617	619	575	572	244	245	1,155	1,154	48.7	66.0	52.7
	4	66.0	212	602	604	559	557	237	238	1,128	1,130	41.8	45.0	38.4
1925	1	65.1	206	580	582	537	536	228	229	1,085	1,089	17.7	21.8	15.8
	2	64.4	203	565	566	521	521	222	222	1,056	1,057	0	6.3	0
	3	61.7	201	567	566	520	521	222	222	1,059	1,058	7.7	0	2.1
Average Percentage Error:				0.18		0.20		0.37		0.16				
1927	3	61.4	173	474	476	406	407	185	185	1,041	1,045	0	100	34.5
	4	61.9	167	463	463	392	393	180	180	1,016	1,016	7.6	74.0	11.7
1928	1	63.0	161	457	456	382	382	176	175	1,004	1,003	23.2	47.7	1.2
	2	64.6	154	453	454	374	374	171	171	1,003	1,003	51.0	18.2	0
	3	66.5	150	457	458	371	371	169	168	1,012	1,013	76.6	0	8.0
	4	67.2	150	467	466	374	374	168	169	1,032	1,030	87.1	1.7	26.6
1929	1	67.5	153	482	481	382	383	170	171	1,062	1,059	96.2	11.9	52.5
	2	68.0	157	500	499	395	395	175	175	1,097	1,094	100	31.5	83.0
	3	67.6	161	511	508	403	401	178	178	1,116	1,109	94.2	49.0	100
	4	67.6	162	507	509	399	400	177	177	1,102	1,106	93.5	51.0	87.3
Average Percentage Error:				0.27		0.14		0.27		0.27				

Columns (a) are original figures.

Columns (b) are calculated from the formulae (p. 515).

## II. Scotland.

		Days.	Men.	Man-shifts.						Output (tons).		Percentage Changes of Maximum Changes.		
				C(a)	C(b)	E(a)	E(b)	S(a)	S(b)	O(a)	O(b)	D	W	O
		D	W	(000)	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)			
1922	2	66.8	122	348	349	289	288	181	180	806	806	0	15.4	12.1
	3	68.7	125	370	371	299	299	188	189	847	848	40.4	53.4	42.3
	4	70.8	128	396	395	310	311	198	198	888	893	83.0	53.3	73.9
1923	1	71.6	131	411	412	319	320	201	204	912	915	100	75.1	92.9
	2	71.1	133	422	420	324	325	206	206	921	914	95.9	93.0	100
	3	71.4	134	423	424	327	326	207	207	921	913	95.2	100	99.8
	4	70.9	134	418	419	325	323	205	205	903	899	85.2	97.7	86.2
1924	1	70.3	133	409	410	318	318	202	202	879	881	73.1	88.0	66.9
	2	69.8	131	399	400	312	311	199	200	857	865	63.3	71.9	49.7
	3	69.0	129	388	388	304	304	195	196	834	841	46.1	62.7	32.3
	4	68.0	127	374	373	294	295	191	191	812	813	21.4	45.5	15.0
1925	1	67.5	123	360	359	286	287	188	187	797	795	15.2	23.4	3.1
	2	67.8	121	353	353	282	282	187	187	793	792	20.4	7.3	0
	3	68.4	120	352	353	281	281	188	188	801	798	33.2	0	6.2
Average Percentage Error :				0.23		0.26		0.21		0.47				
1927	3	70.9	103	307	307	253	253	170	171	832	833	0	100	100
	4	71.3	100	299	299	248	248	168	168	824	822	12.7	79.1	85.1
1928	1	71.7	96	287	288	240	240	163	162	804	804	26.1	48.7	50.3
	2	72.0	93	277	277	233	233	157	157	785	785	33.6	22.5	17.5
	3	72.5	90	271	271	228	228	154	154	775	776	48.8	3.6	0
	4	72.7	90	271	272	228	228	153	153	777	776	50.0	- 0	2.5
1929	1	73.1	91	276	273	232	232	155	156	790	788	77.5	8.6	25.2
	2	73.8	92	283	282	239	239	159	159	809	809	90.5	20.3	59.7
	3	74.1	94	289	289	244	244	163	162	823	823	100	32.2	83.5
	4	74.0	94	289	289	246	245	163	163	823	824	91.7	36.3	83.5
Average Percentage Error :				0.22		0.06		0.22		0.09				

Columns (a) are original figures.

Columns (b) are calculated from the formulae.

## III. Lancashire.

			Days.	Men.	Man-shifts.						Output (tons).		Percentage Changes of Maximum Changes.		
					D	W	C(a)	C(b)	E(a)	E(b)	S(a)	S(b)	O(a)	O(b)	D
					(000)	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)			
1922	2	57.1	134	277	276	313	313	175	175	556	561	0	50.3	0	
	3	58.7	135	288	288	326	325	181	181	580	579	18.7	72.1	23.4	
	4	61.4	136	302	302	340	340	190	190	612	611	48.9	78.9	51.0	
	1	63.3	136	314	314	352	352	197	196	636	634	71.0	90.0	77.7	
1923	2	64.4	136	320	320	357	358	200	200	648	645	83.0	93.1	89.0	
	3	65.6	136	327	327	363	363	204	204	659	659	96.8	90.9	99.9	
	4	65.8	136	329	329	364	364	205	205	659	660	99.1	94.1	100	
	1	65.9	137	330	331	364	365	205	205	657	659	100	97.0	97.7	
1924	2	65.6	137	330	330	362	363	205	205	650	653	96.5	100	91.4	
	3	64.4	137	321	324	356	355	202	202	635	636	83.0	97.0	76.0	
	4	62.6	136	315	315	343	342	196	196	615	615	65.0	79.5	56.7	
	1	61.0	134	303	303	325	327	190	190	591	591	41.5	53.8	53.9	
1925	2	59.8	132	293	293	313	314	184	184	576	577	31.2	20.8	19.2	
	3	59.5	131	289	289	309	308	182	182	573	572	27.8	0	16.2	
	Average Percentage Error :														
					0.11		0.15		0.13		0.24				
1927	3	58.0	117	254	253	263	263	164	164	560	559	66.2	100	100	
	4	57.3	115	244	244	253	253	160	159	544	544	47.7	85.1	74.8	
	1	56.3	111	231	232	239	239	152	152	520	521	17.6	63.2	37.8	
	2	55.7	107	220	221	227	227	146	146	502	503	0	40.9	10.3	
1928	3	55.8	103	214	214	220	220	142	142	495	496	3.8	23.0	0	
	4	56.3	101	213	212	217	218	141	141	496	496	18.2	12.6	1.7	
	1	57.0	101	214	213	219	220	143	142	504	501	38.2	9.4	14.4	
	2	58.1	101	217	216	223	224	144	144	513	512	70.9	7.9	28.7	
	3	58.7	100	217	217	226	226	145	146	517	516	88.7	5.5	34.0	
	4	59.1	99	215	216	226	225	145	145	514	517	100	0	29.8	
Average Percentage Error :															
					0.21		0.15		0.16		0.26				

Columns (a) are the original figures.

Columns (b) are calculated from the formulae.

## IV. Midlands.

		Days.		Men.	Man-shifts.								Output (tons).		Percentage Changes of Maximum Changes.		
		D	W		C(a)	C(b)	E(a)	E(b)	S(a)	S(b)	O(a)	O(b)	D	W	O		
				(000)	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)						
1922	2	59.3	310	721	725	712	709	408	407	1,870	1,878	0	0	0			
	3	60.7	313	740	747	729	731	418	419	1,938	1,934	27.4	5.7	19.1			
	4	62.5	319	793	788	764	768	438	439	2,048	2,034	64.1	22.2	50.7			
1923	1	61.0	325	835	833	802	805	460	460	2,148	2,137	93.0	44.0	79.1			
	2	64.1	335	854	853	822	823	471	470	2,186	2,185	96.6	61.0	90.0			
	3	61.3	337	861	861	833	832	475	474	2,201	2,201	100	67.0	100			
	4	63.9	337	862	854	831	829	472	471	2,181	2,187	92.4	66.7	88.6			
1924	1	63.5	335	834	810	824	822	465	465	2,152	2,156	83.0	62.2	80.1			
	2	63.1	331	828	830	820	818	461	461	2,131	2,133	75.4	60.0	71.4			
	3	62.4	337	824	827	819	816	459	459	2,118	2,124	62.3	66.2	70.6			
	4	61.5	340	819	820	814	812	457	456	2,098	2,107	41.2	73.2	65.0			
1925	1	60.7	341	819	818	811	811	456	455	2,095	2,100	28.4	83.2	61.1			
	2	60.5	348	827	825	817	818	458	459	2,120	2,115	23.9	93.7	71.3			
	3	60.6	350	836	833	823	827	462	462	2,148	2,133	26.5	100	79.1			
Average Percentage Error :					0.26		0.27		0.09		0.32						
1927	3	56.9	343	764	765	757	757	427	426	2,133	2,135	51.0	100	72.3			
	4	56.7	340	759	757	746	746	422	422	2,122	2,121	43.1	91.0	64.8			
1928	1	56.0	334	738	739	718	719	410	410	2,070	2,071	16.4	69.2	29.8			
	2	55.5	326	722	723	690	690	398	397	2,026	2,026	0	39.8	0			
	3	56.0	319	721	721	678	679	394	393	2,030	2,030	18.6	15.0	2.7			
	4	57.0	315	727	727	681	682	395	395	2,064	2,064	53.6	2.1	25.7			
1929	1	58.0	315	738	737	698	698	400	401	2,110	2,114	73.6	0	56.7			
	2	58.7	316	746	746	707	708	407	408	2,159	2,161	100	6.1	90.0			
	3	58.6	318	743	744	712	713	409	411	2,174	2,172	97.4	12.5	100			
	4	58.0	319	734	735	707	706	408	407	2,157	2,152	75.1	14.0	88.6			
Average Percentage Error :					0.10		0.09		0.18		0.09						

Columns (a) are the original figures.

Columns (b) are calculated from the formulae.

## V. Durham.

		Days.		Men.	Man-shifts.								Output (tons).		Percentage Changes of Maximum Changes.		
		D	W		C(a)	C(b)	E(a)	E(b)	S(a)	S(b)	O(a)	O(b)	D	W	O		
				(000)	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)						
1922	2	60.7	153	279	279	455	455	193	193	824	827	0	48.8	26.2			
	3	62.4	156	298	300	473	473	202	202	886	861	36.6	59.1	51.6			
	4	64.1	159	318	321	490	498	211	211	901	899	72.2	68.0	73.6			
1923	1	65.0	162	337	337	498	499	217	217	924	922	91.0	76.1	87.6			
	2	65.2	165	351	348	504	505	221	221	934	933	94.4	85.2	93.6			
	3	65.5	167	361	360	508	510	226	225	944	945	100	92.1	99.1			
	4	65.2	169	366	366	510	510	227	227	945	947	95.0	98.1	100			
1924	1	64.6	170	364	366	505	504	226	226	935	937	81.1	100	94.4			
	2	63.8	168	357	358	492	491	221	221	916	917	66.0	94.0	82.6			
	3	63.9	164	344	345	471	472	213	213	888	888	45.6	81.9	65.3			
	4	61.9	158	327	326	447	447	202	203	854	851	21.9	61.0	44.3			
1925	1	61.5	149	307	306	418	420	191	191	814	813	16.9	27.3	19.7			
	2	61.9	141	293	292	397	398	182	182	786	787	24.3	13.0	2.9			
	3	62.7	137	286	290	390	389	178	178	781	782	41.6	0	0			
Average Percentage Error :					0.38		0.20		0.12		0.10						
1927	3	63.2	125	276	276	347	348	161	164	854	853	0	15.4	0			
	4	63.8	123	276	276	346	346	163	163	854	851	16.1	4.3	0			
1928	1	64.0	122	276	276	346	345	163	162	854	854	20.2	0	0.2			
	2	64.0	123	277	277	348	348	163	163	858	860	21.6	6.0	3.4			
	3	63.8	125	280	280	351	351	164	164	866	865	16.9	15.8	10.2			
	4	64.0	126	285	284	356	356	166	165	879	877	20.8	27.0	21.7			
1929	1	65.2	128	296	296	366	368	171	171	909	907	51.6	42.9	47.2			
	2	66.4	131	310	310	383	383	177	178	944	943	83.6	64.4	77.1			
	3	67.1	134	320	321	395	395	182	182	969	969	100	85.4	98.6			
	4	66.6	136	321	322	398	399	184	184	970	974	87.0	100	100			
Average Percentage Error :					0.11		0.12		0.15		0.15						

Columns (a) are the original figures.

Columns (b) are calculated from the formulae.

## VI. Northumberland.

		Days.	Men.	Man-shifts.						Output (tons).		Percentage Changes of Maximum.			
				D	W	C(a)	C(b)	E(a)	E(b)	S(a)	S(b)	O(a)	O(b)	D	W
				(00)	(000)	(000)	(000)	(000)	(000)	(000)	(0000)	(0000)			
1922	2	63.5	554	1,056	1,053	1,698	1,706	763	761	305	306	21.4	49.4	31.6	
	3	65.0	564	1,126	1,142	1,739	1,725	797	799	318	318	56.6	59.8	57.6	
	4	66.3	572	1,207	1,223	1,747	1,735	829	829	328	327	83.4	68.0	76.0	
	1	66.6	580	1,269	1,290	1,732	1,734	848	848	333	333	96.2	76.0	87.0	
1923	2	66.9	587	1,362	1,342	1,706	1,725	857	859	336	337	97.4	83.8	93.0	
	3	67.0	595	1,411	1,396	1,708	1,718	867	869	340	341	100	91.4	100	
	4	66.2	601	1,420	1,420	1,700	1,694	864	863	339	340	83.1	97.6	98.4	
	1	64.8	603	1,403	1,408	1,663	1,655	845	840	334	334	52.0	100	88.9	
1924	2	63.8	597	1,376	1,362	1,618	1,608	818	814	328	327	31.0	93.9	77.2	
	3	63.1	582	1,332	1,328	1,559	1,549	782	781	320	318	14.7	78.6	61.0	
	4	62.4	555	1,260	1,255	1,469	1,473	735	735	306	305	0	51.1	34.2	
	1	62.5	523	1,193	1,180	1,384	1,398	694	694	292	294	2.6	18.6	8.3	
1925	2	63.1	505	1,168	1,163	1,344	1,355	675	677	288	290	15.2	0.2	0	
	3	63.6	505	1,184	1,200	1,348	1,342	681	683	293	293	26.8	0	9.6	
Average Percentage Error :				0.72		0.52		0.21		0.29					
1927	3	63.3	458	1,073	1,070	1,169	1,189	636	638	315	315	0	100	31.0	
	4	63.8	440	1,039	1,042	1,151	1,150	620	617	308	308	12.4	37.0	13.3	
	1	63.8	431	1,018	1,021	1,125	1,125	606	604	302	303	12.4	3.2	0	
	2	63.9	430	1,022	1,022	1,125	1,125	605	603	303	304	16.7	0	2.4	
1928	3	64.1	432	1,037	1,035	1,141	1,141	608	609	309	309	27.0	7.9	13.6	
	4	64.9	437	1,059	1,055	1,164	1,163	614	619	317	316	38.4	24.4	33.2	
	1	66.3	443	1,098	1,094	1,205	1,205	632	635	331	329	70.4	44.6	65.0	
	2	67.4	448	1,130	1,128	1,242	1,242	649	649	341	341	95.4	64.4	89.3	
1929	3	67.7	453	1,143	1,145	1,262	1,262	659	658	345	347	100	81.3	100	
	4	68.7	454	1,125	1,127	1,249	1,248	656	653	341	341	79.0	86.6	89.7	
Average Percentage Error :				0.23		0.05		0.36		0.20					

Columns (a) are the original figures.

Columns (b) are calculated from the formula.

## VII. Coal-cutting Machines and Output.

	S. Wales.						Scotland.						Iancashire.								
	1922.	1923.	1924.	1925.	1927.	1928.	1929.	1922.	1923.	1924.	1925.	1927.	1928.	1929.	1922.	1923.	1924.	1925.	1927.	1928.	1929.
Mines at Work ...	612	660	656	609	639	552	507	513	512	510	499	506	415	443	355	335	322	313	331	298	277
Mines with Coal-cutting Machines	77	91	100	106	110	101	98	256	273	276	281	270	205	251	116	130	132	123	130	129	139
No. of Machines	301	361	409	405	426	401	430	1,269	1,528	1,628	1,621	1,619	1,604	1,639	947	1,085	1,160	1,091	1,120	1,137	1,053
Tonnage cut by Machines (000 tons) ...	1,818	2,217	2,629	2,567	3,212	3,318	1,178	11,255	17,276	17,027	16,368	19,212	19,001	21,617	3,395	4,572	4,524	4,120	3,775	5,051	6,187
Total Output (000 tons) ...	50,325	51,252	51,083	41,630	40,256	43,312	48,140	35,447	38,491	36,190	33,029	34,698	32,339	34,176	23,553	26,741	26,286	23,339	23,307	20,527	21,550
Percent. of Output cut by Machines ...	3.61	1.09	5.13	5.73	6.91	7.66	8.67	10.15	44.68	47.03	49.55	55.61	56.80	63.22	15.26	17.10	17.21	17.66	16.20	21.62	28.71

	Midlands.						Durham.						Northumberland.								
	1922.	1923.	1924.	1925.	1927.	1928.	1929.	1922.	1923.	1924.	1925.	1927.	1928.	1929.	1922.	1923.	1924.	1925.	1927.	1928.	1929.
Mines at Work ...	604	560	569	551	693	536	512	262	288	293	263	277	265	261	127	124	123	116	124	106	101
Mines with Coal-cutting Machines	175	185	205	223	241	227	221	83	99	110	98	99	95	97	43	44	47	46	50	52	57
No. of Machines	1,822	1,181	1,699	1,771	1,958	1,919	1,983	588	990	1,142	1,049	1,107	1,170	1,319	182	182	182	182	182	182	182
Tonnage cut by Machines (000 tons) ...	10,903	13,584	14,958	15,227	17,322	18,226	21,112	4,155	5,315	5,737	5,152	6,332	7,282	8,755	2,711	3,511	3,872	3,512	3,605	6,000	8,097
Total Output (000 tons) ...	82,731	92,051	91,967	88,425	87,654	82,726	89,153	81,863	88,218	86,089	81,493	84,603	84,709	89,001	13,205	14,294	13,660	11,955	13,506	12,968	14,547
Percent. of Output cut by Machines ...	13.21	14.66	16.26	17.22	19.75	22.03	23.68	11.92	13.90	15.64	16.36	18.30	20.98	22.41	20.53	24.56	28.35	29.38	31.96	50.80	55.63

\* Includes machines at 1 mine in S. Staffordshire and Worcester area.

† Includes machines at 2 mines in S. Staffordshire and Worcester area.

‡ Corresponding figures for 2 mines in S. Staffordshire and Worcester area.

No. of Machines ... 13

Tonnage cut by machines (000 tons) ... 90

## DISCUSSION ON DR. RHODES'S PAPER.

SIR RICHARD REDMAYNE : It gives me very great pleasure indeed to propose a vote of thanks to Dr. Rhodes for his very interesting diagnosis of the inter-relation of labour and output in the Coal-Mining Industry of Great Britain. Its preparation must have absorbed a great deal of time and a great deal of thought, and I congratulate him and thank him for the very excellent way in which he has compiled this paper, and for the admirable résumé of it which he has just given us.

I do not wish to be critical; but there are a few points that I would like to bring before Dr. Rhodes for his consideration. I should like to say at once that many of the results emerging from the diagrams are such as one would have supposed to be coincident with the facts of the industry, but as to others I am somewhat dubious. One would have to devote much more time to their study than has been possible before coming to definite conclusions on all the points raised, but it is particularly interesting to me, and, I think, of peculiar value too, that the theoretical view of this subject should now and again be coincident with the existing facts. Owing to the number and nature of the variables entering into consideration, it is somewhat hazardous to proceed towards definite deductions, which probably explains the author's occasionally somewhat guarded statements.

To proceed to a definite point, the author opens by drawing attention to the difficulty confronting the investigator in other industries in relating production to the number of work-people employed, but says, "We can make a safe direct comparison between the number of labour units worked and the number of output units evolved as a result of this labour" in the coal-mining industry. I should like, however, to point out that there are three disturbing factors in the situation, to two of which the author makes several references, while he neglects the third. They are :

- (1) The enhancement of productive capacity per unit resulting from the increased application of labour-saving appliances.
- (2) Variation in hours worked per unit.
- (3) Improvement in transporting men to work underground, which improvement is stimulated by the shortening of the statutory day.

I know of some collieries where the actual time worked has suffered no diminution owing to the great expedition achieved in bringing the men to their productive work after the advent of a shorter day.

Turning to p. 491 of the paper, Dr. Rhodes alludes to *Seasonal Variations*, and I should like to say here that the results of the diagrams are peculiarly coincident with what would have been expected, seeing that in Durham there is a large export trade, in both summer and winter, whereas Lancashire has mostly, almost entirely, an inland trade, which is most vigorous during the winter and consists largely of industrial and household coal, which trade is

subject to seasonal variation to a greater extent than any other. In the winter there would be greater activity and more regularity of work than in the summer.

On p. 493 Dr. Rhodes makes comparisons, with the idea of deducing general tendencies of changes taking place in respect of the seasons. From long experience, I must say I agree with him in rejecting the idea that miners work less hard in summer than in winter. When the miner really works hardest is when the mine is on short time, and that is a factor that must be taken into consideration in these days. The miner works to obtain a certain standard of comfort—I am glad to say it is always an increasing standard. He has in mind perhaps almost unconsciously a sort of standard or quantum, and if the pit only works three days, seeing he is paid on piece-work, he will work harder per day on those three days than on five days if the pit works five days. I have noticed this fact over many years.

On p. 494 mention is also made of seasonal fluctuations; in which respect one has to differentiate between the different classes of labour. The coal-getter (hewer, collier or stall-man, as he is variously termed), who comes within Class C of the author, is paid by piece-work, and he tends, as I have said, to work harder when the pit is on short time, and during the summer months in most districts—but not all—the pits are on short time. But the collier is only a part of the staff of the pit, the datal hand is not usually a piece-worker. Thus, turning to p. 496, the author points to the fact that necessary functions have to be performed irrespective of the quantity of coal brought to the surface. Consequently, in the diagrams S/O and E/O are especially prominent. This should be especially the case in respect of S/O, for the overheads which are more or less constant, whether the pit works regularly or irregularly, are :

- (1) Pumping.
- (2) Ventilation.
- (3) Officials.
- (4) Clerical staff.

Whether the pit works or lies these four overheads will have to be regarded as more or less stationary.

Turning to *Secular Variations*, the author says, "In the period after the Coal stoppage in 1926 all three (that is C/O, E/O and S/O) have declined somewhat, C/O most." I think that perhaps a factor conducing to this has been the greater use of labour-saving appliances; thus, comparing the years 1925 and 1930, we find that the electrical equipment of mines had increased by 7 per cent., a remarkable figure.

On p. 499 the author states, "But it is reasonable to suppose that in the main the average number of man-shifts worked alters when the number of days the mines wind coal alters, and in the same way." I agree with him except in regard to the last few words—"and in the same way." Alteration there certainly is, but *not* in the same way. The shifts of the productive hands are reduced proportionately, but not so in the case of those of all of the non-productive hands, because they have to be at work to a certain extent even

when the pit is idle. Therefore, when the pit is working short time they work to a greater degree than do the *productive* hands.

On page 500 the author remarks: "This seasonal movement is most manifest in Scotland, Lancashire and the Midlands, and to a lesser extent in South Wales, Durham and Northumberland." There again is a case in point of the agreement of theory with practice—I speak entirely from practice—and this is consistent with it, because, you see, Lancashire and the Midlands are essentially manufacturing household coal districts. Scotland is to some extent, but nothing like to the extent of Lancashire and the Midlands, and South Wales to a still less extent.

There is one point brought out in these diagrams which is of the greatest possible importance; they do show theoretically what one finds practically—namely, that any endeavour to regulate the coal trade by means of a system of arbitrary quotas is illogical and most impracticable, because it does not provide that elasticity which is so necessary to the successful working of the industry, a fact which I think is demonstrated and emphasized by the diagrams in this paper.

I should like to emphasize the conclusion arrived at by the author on p. 513. He has expressed it admirably as follows:—"When there is increasing demand, this is first met by increasing the number of winding days, and later by increasing the number of men employed. Later, the number of winding days begins to diminish while the number of men is still increasing, and after, the number of men begins to decrease also, until the number of winding days begins to increase, while the number of men is still decreasing. The number of men reaches a minimum and then begins to increase, and the process appears to be continued." He then goes on to give three curves which, I venture to say, long experience over the coal trade of this country will bear out to the full. It is a clear demonstration of theory being borne out by actual practice.

Speaking generally, and applying the words of the author himself, any results achieved by the diagrams and formulæ based thereon must, in the nature of the circumstances, be "approximate, empirical, and tentative, and we cannot stress too highly the importance of this fact," nor can we "jump from conclusions which relate to figures for the whole industry to infer what is happening in particular mines."

I am not quite clear what the author means on p. 522. Does he mean that a seven-hour shift is  $6\frac{1}{2}$  hours at the *face*, or an average  $6\frac{1}{2}$  hours *underground all over the mine*? Perhaps he will explain more definitely?

On p. 523 the improvement he mentions may have been due to causes other than lengthening of the shift by half an hour: it may have been obtained by the saving of time in getting men to the *face*, or, as he says, to "definite improvement in efficiency generally." I doubt if it was due to the more efficient mines being used for production.

These are all the points that have occurred to me at the moment, but I could with advantage spend a great deal more time in studying the paper than I have done.



I should like to propose that a very hearty vote of thanks be accorded to Dr. Rhodes for his excellent, interesting, illuminating, and valuable contribution.

THE PRESIDENT, in calling upon Sir Hugh Bell to second the vote of thanks to Dr. Rhodes, referred to the many years of experience that Sir Hugh had had of this subject. Sir Hugh had become a Fellow of the Society at an age when most Fellows were handing in their resignations owing to senile decay. To him these trends must appear as mere oscillations in his own experience, and there was no doubt that in the great background of knowledge that he had built up and placed at the disposal of others, he could throw a great flood of valuable and practical comment upon the subject under discussion. He did not know how far Sir Hugh would descend into the same arena with Dr. Rhodes and meet him with his weapons; the contest might be on different planes and never meet!

SIR HUGH BELL: You fill me with confusion, almost with shame, Mr. President, by the remarks which you have addressed to this meeting in introducing me to it. It is indeed true, I admit, that I have been engaged in mining actually about half as long again as my friend, Sir Richard, but whether I have now any better knowledge of the subject than I had fifty years ago is another question, and I therefore have some hesitation in accepting the invitation you were good enough to extend to me to second this vote of thanks.

I had intended first to call attention to the opening words of Sir Richard's own remarks, which seemed to me singularly inappropriate as addressed to the Royal Statistical Society. He expressed some doubt on the value of any statistics at all. That, however, is an old complaint, and no doubt had something to do with the old joke that "Figures cannot lie, but the people who use them can and do." I am not quite sure that the absolute inner sanctum of the Temple of Truth has been reached by Dr. Rhodes. That, however, is another matter, and I will not follow Sir Richard further in his remarks on the value of statistics.

Turning to the paper itself, I would like to join in offering Dr. Rhodes my sincere congratulations on the work he has done, which must have involved a great deal of labour, and I am going to show my feeling of gratitude by saying that gratitude is a lively sense of favours to come.

The two periods with which Dr. Rhodes deals happen to be two periods during which the coal trade was involved in pretty continuous interference of one sort or another by the Legislature. If we go back another period of years we shall find the same sort of thing happening, but prior to the war, before 1912, though there was a great deal of legislation connected with the coal trade, it was almost all of a character with which, on general grounds, little fault could be found. Subsequent to that, I think legislation does come under the adverse comments which, as I understand it, Sir Richard quite properly passes on it; it has interfered with the freedom of master and man alike to deal with their own affairs. You have a striking

example before you at the present moment, where in two important districts employers and employed are agreed in declaring they will not obey the law, and are about to be proceeded against to compel them to do what, if they had their own free will, they would not do. That cannot fail to influence the existing diagrams which Dr. Rhodes has prepared. If it were possible to make a comparison going back forty or fifty years, I think probably very different results would be shown. I am afraid that is not possible, and one has to deal with things as they are.

It is a cynical observation, and Sir Richard avoided it with great dexterity—I hardly know how to put it into words which will be less cynical than Sir Richard's—but has not Dr. Rhodes with great elaboration and very great skill indeed proved to us quite conclusively that  $4 \times 4 = 16$ ? Does it not all come to this, that the relation between men and output is proved to be of a character of which everyone engaged in the coal industry has been conscious, and all that Dr. Rhodes has done has been to give a diagrammatic demonstration of that of which we were all perfectly well aware before we read his paper. That does not detract from the value of the paper, because it may well be that from considerations of this kind we may get a knowledge that will enable us to conduct our trade—if the Legislature will allow us any freedom at all in its conduct—more wisely than we have done in the past.

In his remarks Sir Richard has covered the whole of the ground I desired to cover in regard to the paper. What is interesting to me, as engaged for many years in intimate relations with men who are coal-miners, has been how what may be called the psychological aspect of the case has almost entirely disappeared, and I am afraid that is the effect of statistics, which have the effect of rubbing out the individual altogether, leaving nothing but the mere abstract of the individuals—not the men or the women themselves. One of the observations made by Sir Richard, which must have occurred to everyone, was that there was a direct counter case that took place in many conditions of trade in regard to the way in which men would work. If trade were bad, the tendency was for men to work better and more regularly; if trade were good, the opposite took place. Men lost more time in good times than in bad, and that applied not only, as might be expected, to the piece-worker, but also to a very large extent to the dayman, whether he be underground or on the surface. It is perfectly true that the piece-worker, if he works harder, gets more money, and if less, less money, but if he is able to make what he regards as a reasonable wage he is content to work less and have more leisure in good times than in bad. The dayman also will have a tendency to slack off one or two days a week in good times. We have noticed that in good trade the whole of the work is more irregular than in bad. That observation of course applies very directly to the relation between a day's work and the output, and I think probably a further examination, if it could be made, in which there was some possibility of seeing the relation between time lost and output, would show very interesting results.

With regard to the improvements which have taken place in

mining generally, I think there are two observations to be made. One is, that by the force of circumstances no doubt the coal-owner attending to his business has greatly improved all appliances of every kind. As a person engaged in the industry for getting on for three-quarters of a century, I would say that the one person that the industrialist hates like poison is the inventor. Sometimes he is right; very frequently he is wrong; on the whole no doubt the inventor has contributed to the advantage of mankind, but has imposed on the industrialist expenditure he would have gladly avoided.

The other point is as to the transport of men underground. No doubt that has very greatly improved. This has come about partly through the coal-owners being permitted to carry men underground in a way not previously allowed, and partly because in a great many cases the mines have now been worked for a great many years—some for centuries—and as the coal is deeper it has been necessary to extract it from a larger area, which has made it necessary to improve the underground haulage both of coal and of men into the coal.

I have only one word to say in conclusion, and that is when viewing the subject from the economic side, with which Dr. Rhodes has not dealt at all. All of us engaged in the coal industry must be filled with apprehension as to the prospects there. There is a tendency to impose upon an industry which has always been conducted on an extraordinarily narrow margin of profit, further burdens which look as if they might cripple us to a great extent, and which make the more far-sighted of the persons engaged in the coal trade seriously consider what their position will be in the future. I became a colliery owner because I wanted coal as a means to making iron. I am not a coal-owner; I am an iron-master. I work coal because I want it for my furnaces. I am now to be under the obligation so to arrange my mines as may make it necessary—although having coal enough of my own to supply my iron works—to restrict my output and buy coal. It must be agreed that a Legislature that makes people lose work they desire to perform is a kind of Legislature which even a statistician who cares nothing for the individual must agree in heartily condemning.

SIR JOSIAH STAMP said that before putting the vote of thanks to the meeting there were one or two observations he would like to make on the paper under discussion. Whenever a work of this kind was done to prove a case by abstract methods, the results either agreed with general practical experience or disagreed. If they agreed, the comment of course was, "This is a very elaborate way of telling us what we knew already"; if they disagreed, people said, "Of course you can prove anything with statistics." It was difficult for the mathematician to satisfy everyone. Undoubtedly Dr. Rhodes had produced something of very considerable value. It could not be rubbed home too frequently in industry or to the public that "spreading work" was from an economic point of view, if not from a temporary humanitarian point of view, uneconomical. The best results were obtained by having the fewest number of men working to their full capacity; although in temporarily depressed times short-time

work might be begun, the total costs were too great for it to be a proper permanent remedy. This was a good example of the principle which people were apt to forget, but it could only be the best economy to work the best man for a particular job at his fullest capacity. This fact was fully borne out by Dr. Rhodes's results.

It had often been said in the past that the chief cause of industrial strife and suspicion was the complete lack of information about what was happening. Masters themselves had not full information of what was happening to the industry as a whole, of which they formed a part. It was the same with the men, and all kinds of suspicion arose. It had been said that if there were plenty of information on the table the men were sufficiently wise to understand and recognize the situation, and that the causes of dissension would vanish. No industry had ever been documented as much as the coal industry during the past ten years; every conceivable statistical "slant" had been taken through it, and legislation passed upon it, yet this had hardly succeeded in producing harmony between the participants in the industry. After having been told that all that was wanted for peace in industry was full information on the subject, it was most disappointing to find that this was not so.

Probably Dr. Rhodes was glad he had not been interfered with by questions of average prices. So many statistics were simply built up as functions of each other, and in these days there was no one to explain exactly how they were built up, especially in the pre-war statistics, unless Mr. Macrosty would write a thesis on the subject.

It was not to be wondered at that Dr. Rhodes's trend for underground workers should move differently from that for those at the face. Even with coal-cutting appliances the tendency for there to be a movement of costs and men with the total output must be more direct. Of course, if the inventions and devices by which coal was moved and which affected the number of people working not at the face proceeded as rapidly as actual coal-cutting, one might expect a difference to arise from that point of view alone, and it was to be imagined that there would be considerable difference in the rate of application of the two kinds of machinery.

The second point was that the two costs naturally moved differently as a function of total output. In places where the output was rapidly falling off, with these overhead costs it was necessary to have a number of men to supervise, whereas the direct labour at the face could more quickly be controlled.

The third point was that even those working at the office were, compared with those working at the face, overhead costs; that was always the point at which in hard times the managers endeavoured to economize. There were thus three variable factors at work, and it would be an interesting study to see how far the variant working with the total output was a controlling factor.

Sir Josiah then put the vote of thanks to the meeting, and it was carried unanimously.

PROFESSOR JEVONS said he had been greatly impressed by two

things on reading the paper—first the amount of work Dr. Rhodes had done in gathering the statistics of the industry, and second, as Sir Richard Redmayne had pointed out, the extent to which his conclusions had confirmed those which practical men and those who had gone into the economics of the coal industry had already arrived at. It seemed that Dr. Rhodes had covered the ground with his figures, and there was really nothing left to criticize, although there were one or two points which it might be interesting to mention.

If the S/O ratios for South Wales from 1927 onwards on p. 490 were compared with those of Durham, it would be found how different was their trend. Again, there was a very striking movement of the C/O and E/O ratios in the case of Northumberland. He would like it to be made a little clearer as to what Dr. Rhodes considered to be the cause of these differences, as sufficient information had not been given. In the case of Northumberland, this very striking change of C/O rising while E/O fell raised the question as to whether that was due to some change in the organization of the working of the mines, or whether it might be due to a change in the classification of the statistics, or the method of determining whether a worker was working at the face or elsewhere.

Professor Jevons found something peculiarly interesting in the generalizations on p. 513 as to the lag of the output, relatively to shifts per worker and number of workers relatively to output. It was this last point which had to be taken account of in any measures proposed for reorganization of the industry. Proposals were always being considered for reorganizing the coal industry, and this tendency for an aggregation of workers in the industry because there had been temporary increase of demand needed to be well pressed home. He was glad to see that the statistics did that. On p. 520, in reaching his conclusions, Dr. Rhodes said, "Theoretically it appears that the most efficient method of producing output of changing volume would be to have the industry organized in such a way that there was a constant high average number of days worked, with a changing number of men employed, these changes being made in response to changes in demand." So it would be, if one considered the question solely as it presented itself from figures and ordinary methods of working in past years. However, this assumed that there must be a fringe of workers who could be drawn upon in time of sudden increasing demand; and the increasing demand usually affected the great majority of the collieries at the same time, so that the fringe from one colliery could not be transferred to another, as they would all be drawing on the fringe at the same time. Therefore there must be during certain months or years a large number of workers unemployed, which was a serious aspect of the industry from the national point of view. One could conceive of the possibility of getting rid of this difficulty when looking at the coalfield as a whole; this might be done partly by pooling of orders and by providing for a larger storage of coal, although he knew the difficulties of storage owing to certain qualities of coal not standing it. It had been done, however, to some extent in other countries, and engineers might go

into this question of storing coal to a greater extent than had been done so far. It was possible that the cost would not be so great as many people were apt to think, and considerable storage of coal from slack to busy periods might be more economical in the long run than the present methods.

Professor Jevons added his congratulations and thanks to those accorded to Dr. Rhodes for his paper, and for the immense amount of information and valuable conclusions that he had given.

MR. A. M. NEUMAN said he was much interested in the paper and in the interesting figures which had been given. Dr. Rhodes divided the periods into two and dealt first with the years 1921-26. His ratios E/O, S/O, and in some cases C/O, showed a certain tendency to fall in this period. It would seem that Great Britain was not isolated in this general movement of rising output per worker, but that, taking the outputs in the various European countries, the same tendency would be seen in Germany, Poland, and France. It therefore seemed that to take this first period alone and to draw certain conclusions based on these general post-war lines in the output per worker might be somewhat misleading. At the same time, it would be good to find some method of linking the first period (1921-26) with the second period (1927-30) considered by Dr. Rhodes. This was difficult because in two periods the time worked in the mines differed. But as the statistical considerations required a large denominator, it seemed desirable to try to measure the output not on a daily shift basis, but on a daily shift per worker and per hour. It was true that a reduction of hours or an increase in the hours, say from seven to eight, did not mean a proportionate increase in the time actually worked, but if the time necessary to walk up to the face and the winding time were considered, it was quite possible, theoretically, to measure all these on a larger basis, which would work as well for the first as for the second period. It would not be necessary to consider the two periods separately.

Sir Richard Redmayne had already mentioned the existence of the psychological factor in production which influenced the output per worker. He mentioned what might be called the negative influence of the earnings, which meant that shorter time induced the miner to work harder and get a larger payment. On the other hand, it did seem that this rule also worked in a positive sense, viz. that a larger payment induced the worker to produce more coal. This positive working of the Law of Wages was recently referred to in a report published by the Department of Mines in Poland for 1929-30. Excepting in the last quarter of 1929, each increase of wages per ton of coal produced was coupled with a larger output per worker. It would therefore appear that this aspect which Sir Richard Redmayne mentioned in the negative could be also proved in the positive sense.

MR. HUBERT GREENWELL thanked Dr. Rhodes for his paper, in which there were one or two points to which he would like to draw attention. Dr. Rhodes carried his figures up to 1929, and he would like to point out that in the voluntary schemes which were working

with greater or less success before the passing of the Coal Mines Act of 1930, there was a striking difference in the method of meeting a falling demand. In the Midlands under the Five Counties scheme this was met by the organized working of short time at the whole of the collieries, whereas in Scotland the plan was adopted of laying off selected pits under a system of compensation. This might be expected to affect the relative movements of D and W in the graphs, but it did not seem to have had this effect, and the conclusion to be drawn was that which was known to be correct, that the Scottish scheme was a failure.

Another point was that during the latter part of that period there was a certain number of large amalgamations taking place in the coal-fields, and it seemed that that had a tendency towards trying to satisfy the quota requirements by the temporary or permanent closing of entire pits rather than by working the pits on a proportional basis.

It would be interesting to know if Dr. Rhodes had considered the effect of the Unemployment Insurance Acts? In late years it had been the practice of certain collieries to work an organized three days week, especially in the house coal districts where the trade was seasonal in character.

Dr. Rhodes did not appear to make any mention in the paper of the fact that the ascertainment period in South Wales did not exactly coincide with the periods in the other districts; it was moved forward by one month.

DR. RHODES, in reply, said: I should like to take advantage of the offer to make a full reply later in the *Journal*, but there are one or two points which I should like to mention now. Sir Hugh Bell wondered if I had not been labouring the obvious when he suggested that I had arrived at results analogous to  $4 \times 4 = 16$ , but the President said something pertinent on that point. Sometimes statisticians do feel that they are stating obvious truths, but that it is useful occasionally to state these in numerical terms; also things which are well known to those intimately concerned are not always known to others. For instance, I was interested to note when analyzing these figures that, whereas it was hoped that, by lengthening of hours from seven to eight, improvement in working results would be of the order of 14 per cent., the changes in the industry from time to time, irrespective of changes in hours, result in changes of working results of anything up to 10 per cent., as the diagrams in the paper illustrate. We, the general public, are led to think that improvement can only be obtained by lengthening hours, but actually, judging by past results, improvement is also obtained by other means to quite a considerable extent. This kind of information is quite usefully brought out, I think, in these diagrams.

There is another point which I should like to stress here. In the paper I was dealing only with the figures relating to the whole industry, and it is inevitable that changes in particular mines should be masked when total and average figures only are available.

Professor Jevons referred to the changes in operating results in

Durham and Northumberland in the period before 1926. I had hoped that Sir Hugh Bell would dwell on this. Mr. Greenwell referred to the fact that the period covered in the South Wales returns differed slightly from that of the other districts, being, for instance, February, March and April for the first quarter instead of January, February and March as in the other districts. I had not specifically stated this fact; I had referred to the Quarterly Statistical Summaries for the original data, and of course this distinction is made therein. No direct comparisons were made in the paper which would be upset by this distinction. I am much gratified by the way in which my paper has been received.

After the meeting, Dr. Rhodes sent the following supplementary remarks :

Sir Richard Redmayne spoke of the time actually worked underground. I was referring to the fact that a seven-hour day does not necessarily mean, in the Coal industry, that seven hours are actually worked. The Coal Commission 1925 paid a great deal of attention to this point and I would refer to their Report, Chapter XIII and Annex, Section 4.

Professor Jevons' reference to changes in working results in Durham and Northumberland calls for more comment. In 1923, when, owing to the Ruhr occupation, Durham and Northumberland were mining coal at full pressure, proportionately more men were working at the coal-face than elsewhere below ground and on the surface (see diagrams 15 and 17); consequently the ratios C/O were much greater compared with E/O and S/O. Professor Jevons also referred to the problem of better working results being obtained when the mines worked more days rather than employed more men. At the present time, of course, there is a large body of men forming a "fringe" from which workers can be drawn if there is a sudden demand, but in ordinary times also there is probably a fairly large potential fringe consisting of new entrants into industry, men of poorer physique who are not "in work," older men, men who have been laid off on account of accidents, and so on.

It is doubtful if it is wise to do as Mr. Neuman suggests, viz. bridge the gap occasioned by the 1926 stoppage by introducing a factor which will make the figures relating to 1927 onwards comparable with those before 1926. The size of this factor would be in doubt.

As a result of the Ballot taken during the meeting the candidates named below were elected Fellows of the Society :—

Harold Graham, A.S.A.A.  
Chunilal Karsondas.  
Ben Sidney Lane.

Stanley G. Lyon.  
Charles H. Tyson, B.Sc., A.C.A.

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## MAJOR AND MINOR TRADE FLUCTUATIONS.

By O. M. W. SPRAGUE.

[Read before the Royal Statistical Society, June 16, 1931,  
the President, Sir J. C. STAMP, G.B.E., in the Chair.]

It is with no little hesitation that I submit to the Royal Statistical Society a paper which includes no presentation of statistical data in support of its conclusions. I sustain myself, however, with the hope that the paper may suggest to members of the Society something more significant than tables and charts of my own construction—the urgent need for further statistical investigation of trade fluctuations along lines which hitherto seem to have been strangely neglected.

The need for further investigation is evident. Although statisticians and economists in recent years have given more attention to the study of trade fluctuations than to any other problem in the wide field of economic enquiry, there is a conspicuous absence of agreement in our conclusions regarding the causes of fluctuations and the means of establishing a closer approach to stability in the conduct of economic activities. Still more extreme is the diversity of opinion on the policies which might serve to extricate the world from the morass of the present business depression. Expert economic authority and statistical support can readily be found for quite contradictory programmes of action for dealing with the existing unhappy state of affairs, including, perhaps, that of doing nothing at all. This lack of agreement is, I believe, due in large part to a failure to subject the diversities among trade fluctuations to that careful scrutiny that has been given to the detection of uniformities. We have been preoccupied with the problem of the periodicity of trade fluctuations. A wide variety of statistical series has been subjected to refined methods of adjustment and vividly charted, depicting clearly every slight fluctuation in the volume of trade and the course of prices. These investigations have indeed disclosed a rhythmic movement in trade, but only by the inclusion of fluctuations that exhibit the widest diversity in successive periods of prosperity and depression. A few are of an extreme character, leaving a permanent impression, while many were hardly noticed at the time they were experienced and have only been brought to memory by painstaking study. It may

perhaps already have been observed that I have carefully avoided using the term trade or business cycle, speaking only of trade fluctuations. This is because I would emphasize the point that trade fluctuations vary greatly in magnitude, and also because I would emphasize the point that depressions of major magnitude have been irregular in occurrence. I surmise that they may be in part the result of an accumulation of poison in the economic system from a succession of minor reactions and revivals, though to what extent this may be the case I do not pretend to say. I have no hesitation, however, in expressing the opinion that in our analysis of trade fluctuations it is of fundamental importance to distinguish between major and minor fluctuations. Failure to make this discrimination is, in my judgment, a fundamental shortcoming in the analysis of trade fluctuations that has been made by that group of economists and statisticians who may be styled the "Monetary School," and whose proposals for securing greater trade stability I shall now examine.

The lack of agreement regarding trade fluctuations is nowhere so abundantly illustrated as in the current discussions of the policies of Central Banks. As guides for the determination of those policies we must candidly admit that our economic analysis is as yet inconclusive and our statistical data inadequate. Not, I hasten to add, that it can ever be expected that Central Bank policy can be determined on the basis of economic analysis and statistical evidence alone. But the Central Banker may reasonably look to such sources for something more helpful than a confusing babel of discordant opinions. Accordingly, it is the purpose of this paper to indicate the character of statistical data with accompanying economic analysis which, I believe, would be of material help in the determination of Central Banking policy in the circumstances of the present depression, together with somewhat incidental consideration of the contrasting situation of abounding prosperity.

The direct influence of Central Banks is exerted through changes that they may bring about in the cost and quantity of short-time credit. Ability to contract is limited by the total amount of earning assets and gold, but that is a limitation of little practical significance, since in a period of widespread business activity the imposition of high rates and a moderate diminution in the volume of Central Bank credit will exert a potent restraining influence, always provided this policy is adopted in a sharp and drastic fashion rather than gradually and with obvious hesitation. The ability of Central Banks to increase the supply of credit, on the other hand, is limited in some degree by statutory restrictions on their investments and by the reserve requirements to which they are subject, and here

we are confronted with the question of the responsibility of gold for the present depression, a matter which has given rise to endless controversy. As has been clearly shown in the report of the Gold Delegation of the League of Nations, whatever the future may have in store there has certainly been no world gold shortage in these recent years. As for the so-called mal-distribution of gold, that is a symptom of international financial and economic disequilibrium, a condition that must be corrected mainly by financial and economic adjustments in the countries which find it difficult to maintain adequate supplies of gold. Gold might indeed be regarded as a potent factor in the depression if it were exerting a controlling influence in limiting the freedom of Central Banks taken as a whole in determining the cost and quantity of credit, but, as in all other depressions, Central Banks—or some of them at least—have been in a position to extend additional credit in large volume. The difficulty is that they have not been convinced that lowering the cost and increasing the quantity of credit would serve to bring about a return of activity upon a secure foundation. If convinced of this possibility, no serious difficulty would be encountered in securing whatever measure of co-operation among Central Banks might be needed to execute the policy.

The case, as presented by those economists and statisticians who hold that trade recovery might speedily be brought about by means of a liberal credit policy, may be stated in its simplest form as follows :—

The declining prices that always characterize a period of depression are invariably followed by some advance when trade recovers, and this upward movement of prices involves the more active employment of existing currency and demand deposits, together with an increase in their amount. It is therefore argued that the Banks by increasing credit can induce an upward movement of prices, which in turn will induce traders to give orders to producers, with resultant activity in no short time spreading throughout the entire economic area. Another line of analysis leading to very much the same conclusion as regards credit policy directs attention to the excess of savings over investment, and urges that by reducing the cost of credit and increasing its quantity the Commercial Banks will be induced to invest more heavily and to reduce deposit rates to such a point that savings deposits will be invested by depositors on their own account, thus setting free further reserve balances as a basis for still more credit. And, further, it is urged that at some very low rate of interest it will be possible to induce a sufficient demand for capital to absorb current savings and so to check the fall in prices that is attributed to the excess of savings over investment.

No Central Banker, so far as I am aware, has found these doctrines sufficiently convincing to lead to the adoption of the policy of flooding the money markets with reserve credit in a period of profound depression. In general, Central Banks have merely followed the easy tendency of the money markets, which under any form of banking organization comes with depression, at times hastening the movement by active open market operations. In the absence of definite experience, it would be most unreasonable on the part of the Central Banker to expect the economist and statistician to furnish positive proof of the effects of flooding the markets with short-time credit in a period of depression. On the other hand, he may reasonably expect that past experience with depressions will have been examined from all angles that might be of assistance in the solution of this problem. And this he does not find. Not improbably, the recessions of 1923 and 1927 have been called to his attention in support of the view that recovery can be brought about by means of abundant credit at low rates, since in those years that policy was definitely adopted by the Federal Reserve System and other Central Banks; but the experience of the banker inevitably impresses upon him the diversity that trade fluctuations exhibit, and to him the present situation seems in important respects quite unlike the recessions of four and eight years ago, differing in ways that are not fully disclosed by our statistical data or given due weight in our economic analysis.

In the first place, when activity returned in the autumn of 1924 and 1927, there was comparatively little industrial change as contrasted with the periods of activity immediately preceding in 1923 and in 1926. It may even be argued that somewhat more of readjustment in those years of recession would have been of advantage, providing a firmer basis for prosperous business. But without pressing that point I venture to think that there would be general assent among bankers to the view that the next period of activity will exhibit striking differences from that of the late 'twenties in the proportions of different commodities produced as well as decided changes in location, business organization and financial structure, and, I venture to add, changes in the relative money incomes of various groups among farmers and the salaried and wage-earning classes. At all events, it is the profound conviction of the necessity of such readjustments that disposes the banker to believe that it is dangerous to regard the present depression as similar to the recessions of 1924 and 1927.

In the second place, the financial position is obviously very unlike that which obtained four or eight years ago. In those years, and also after the collapse of the post-War boom in 1920, there

was no lack of potential applicants for capital, both public and private, whose credit rating was satisfactory in the judgment both of issuing houses and the investor. Both financial and economic adjustments would now seem to be required in order to lay a broad foundation for a satisfactory market for capital, both on the side of demand and of supply. It is possible that an easy money market and a more active bond market might facilitate these adjustments, but it is equally possible that, far from ensuring that these adjustments are made, they may prove a positive obstacle. Apparently, the world at large has become less capable or more unwilling to make painful economic adjustments than in former periods. Both Governments and large sections of the public, representing capital as well as labour, are exerting strenuous efforts to maintain the *status quo* that had been reached when business was more active, employing such contrasted policies as the holding of commodities off the market that are in over-supply, the imposition of tariff barriers, or the contraction of production with resultant unemployment. Measures of this character can hardly be expected to restore confidence in the investment market.

Finally, the price situation is such as to render the feasibility of bringing about a recovery through liberal supplies of bank credit altogether improbable. In general, commodities supplied by numerous scattered producers, the output of which cannot be readily restricted, have experienced an extreme price decline in spite of, or in some measure in consequence of, measures taken to withhold stocks from the markets. On the other hand, in the case of many commodities, principally manufactures, the price decline has been far less extreme because it has been possible to reduce output with accompanying unemployment or part-time work. Trade recovery and its accompanying rise in the general price level presupposes the re-establishment of something more nearly approaching the former equilibrium between agricultural prices on the one hand and manufactured goods on the other, and it would seem evident that this equilibrium cannot possibly be secured through an upward movement in prices of commodities which have experienced the more extreme declines. Readjustment apparently requires a further considerable decline in prices of manufactured goods, and this must involve reductions in salaries and wages as well as in other costs. The obstacles, political and social, that must be overcome are indeed great, but this is not the affair of the economist or the statistician. Their investigations should be directed towards the determination of the policies that might be expected most speedily to lead to trade recovery, relying upon the good sense and intelligence of the community for their execution.

Through appropriate analysis and investigation it is obviously the proper function of the economist and statistician to endeavour to discover not only the appropriate adjustments for meeting a situation like the present of extreme depression, but also to furnish the necessary groundwork for policies designed to secure a more stable industrial future. A distinguished member of this Society has emphasized, in this connection, the essential instability of credit. I would wish to emphasize, in our present social order, the essential instability of industries that are, for any reason, experiencing a profitable demand for their products. Profits are largely reinvested in plant, and because profits are large additional capital is readily secured. Over-development in such circumstances is well-nigh invariable; witness the automobile industry in the United States with a present estimate capacity of something like 50 per cent. above any profitable demand in a normal year. The presence of this tendency suggests a wide field of enquiry. It centres about studies of the varying possibilities of demand for the products of different industries, including agriculture. With full employment of capital and labour, improvements in the arts make possible, and probably at an accelerated rate, an increase in the real income of the community, but at the same time they make for economic instability if the increasing productivity in particular industries does not encounter an elastic demand for its products. At the moment, the situation is most strikingly seen in agriculture, an occupation in which it would seem that technical knowledge is fast removing cultivation of the soil from the régime of diminishing returns. A larger proportion of the population must somehow find occupation elsewhere than in agriculture.

Detailed studies of demand by economists and statisticians should afford helpful indications of the industries in which such displaced labour might be absorbed. A hasty examination of one such possibility will serve for purposes of illustration. Assuming a reduction in the cost of construction of houses of moderate size, there would seem to be assured a demand of almost unlimited proportions. It seems by no means inconceivable that a reduction in the cost of producing housing accommodation as considerable as that which has characterized the automobile industry in recent years is entirely feasible. Let six-roomed houses be produced for the present cost of a four-roomed house and a demand for materials and labour will soon be encountered, to say nothing of the demand for the appropriate additional furnishings. Unhappily, it is precisely in this field that the cost of labour and materials became relatively high some years ago, and these costs have been in large part maintained throughout the course of the depression. As a consequence,

far from providing a demand for the surplus labour in the stagnant industries, construction even where stimulated by large appropriations of public money does not fully employ all of the men who belong to the building trades.

In this all too summary fashion I have set out what may be called the equilibrium view of trade fluctuations. According to this view banking and other financial agencies cannot bring about a recovery from a major depression. The economic adjustments that are required can neither be imposed upon the community by means of limitless contraction nor induced by unlimited credit expansion. Other agencies are required. In the past adjustment has come through the ruthless working of impersonal economic forces; now, in some countries, by government order; but under a democratic régime in government and in industry, adjustments must be made in a managed fashion and more or less with general consent. Such a managed course of adjustment to be successful must in substance, though more equitably, reach the same goal that would be reached through the impersonal working of impersonal economic forces, and for guidance in the determination of necessary adjustments the community may reasonably expect much both from economists and from statisticians. And in this connection I would venture to repeat that it is not the business of the economist or the statistician to limit his analysis by the assumption that the community will refuse to take any particular road toward recovery from depression, such, for example, as a general readjustment of money incomes. It is rather our business to determine so far as may be whether any given course promises more or less speedy results than other courses that might be followed.

To maintain a high degree of economic stability under conditions of rapid increase in productive capacity is by no means a simple matter, and when a wide departure from stability has occurred the obstacles to recovery cannot be overcome by any simple or single means. As we look back over the years preceding the depression we do not discover any one guide to action that would have maintained stability: no extreme upward movement of prices preceded the unexampled price decline of the last two years, nor was the development of unsound conditions made manifest by the course of prices of particular groups of goods, whether agricultural and manufactured, basic and finished, or instrumental and consumable. We can now see that there was over-development of some products in each one of these groups, just as we may be reasonably certain that the next period of activity will exhibit an increased demand for a variety of goods in each of these categories.

If now we endeavour to determine the measure of responsibility

of finance for the creation of unsound conditions in the period before the slump, I think it will be agreed that the faulty distribution of resources was far more responsible than any inadequacy either of banking credit or of investment funds: Commercial Banks in granting credit and Issuing Houses in the selection of new issues of securities did little to prevent over-borrowing by Governments or the inordinate expansion of particular industries. Here the Central Banks might well have exerted a restraining influence, even though the guides of rapidly rising prices or of speculation in commodities were not in evidence. More particularly, restraints should have been exercised by the Federal Reserve System in the winter and spring of 1928. No experienced person can doubt that determined action at that time would have been effective as a check upon the speculative movement on the New York Stock Exchange. On the other hand, the responsibility for the depression of speculation on the New York Stock Exchange is commonly exaggerated: it did, indeed, induce the over-development of certain industries in the United States that experienced a spurt of demand from persons temporarily in receipt of actual or paper profits from dealings in securities, and it also enabled some companies to secure funds at abnormally low cost; further, the attraction of funds to New York from overseas was undoubtedly a dislocating influence. But when every allowance is made for these factors, it can be said with confidence that had sound conditions generally obtained throughout the world, recovery would speedily have followed the bursting of the speculative bubble in the autumn of 1929.

My analysis of the matter suggests that even on the financial side the problem of trade fluctuations is not primarily monetary in character. For the prevention or moderation of these fluctuations we must concern ourselves with the distribution of resources much more than with their quantity and cost. And similarly with the means of recovery from deep depression. The insuperable obstacles in the way of recovery from depression through abundant credit are the deterioration in the quality of existing investments and the absence of an abundant supply of good new loans and long-term securities. Let me illustrate by the particular case of an applicant for large amounts of additional capital in normal times—the railways of the United States. Gross and net earnings have declined sharply; wages, salaries and the price of rails not at all; and the price of other equipment by perhaps 10 per cent. In these circumstances, even though the weakened credit of the roads was no obstacle, the lowering of interest rates alone would not induce a normal demand for capital from this source, to say nothing of the large demands that would result from the adoption of a general programme of electrification.



Again, steel producers in the United States operating at less than 50 per cent. of capacity are maintaining prices at a level less than 15 per cent. below those obtaining before the slump. Surely this policy does not encourage the investment of capital in cases where steel is one of the chief requirements. Consider also those eager, insatiate borrowers—Governments. With unfortunate liberality the Governments of many countries in recent years secured funds for a variety of economic undertakings. In many instances these undertakings, like American railways in the past, were in advance of needs and are for the time being unprofitable. But, unlike the American railways, the refuge of receiverships and reorganization is not readily available to Governments, consequently the burden of past obligations casts a shadow upon prospective new issues of Government loans.

What then may be done through financial agencies at the present time? Very little, I should be disposed to say, by these agencies alone. They can carry through the liquidation of bad positions with a minimum of loss and may prevent unnecessary failures by refraining from the withdrawal of funds in situations where patience and co-operation may serve. Central Banks may properly be expected to maintain easy conditions in the money markets and to stand ready as trade revives to supply additional reserve credit as a basis for expending operations of the Commercial Banks. And finally, and above all, it is essential that Commercial Banks with courage and foresight shall support the multitude of enterprising entrepreneurs through whose efforts industries and markets may be developed that will absorb the labour released from those industries that for technological or other reasons exhibit a capacity in excess of a profitable demand.

It does not fall within the scope of this paper to do more than suggest the general character of the economic adjustments that might be expected to hasten a trade revival. At the present time, financial resources are not lacking. Our difficulties are on the side of demand. In a world honeycombed with contractual financial obligations the persistent downward course of prices involves increasingly intense strain, but the evil cannot be attacked directly. Measures both positive and negative are required.

The adjustments to be made are so many and difficult that policies are evidently undesirable that must impose the necessity for still more adjustment. For this reason, additional tariff duties, at all events in countries already having high duties, are obviously to be deplored. Again, since trade adjustments required for the continued payment of reparations and inter-Allied debts have not been completely accomplished, a moratorium or an entire

or partial cancellation would be helpful. In some countries, modifications in taxation designed to relieve reinvested profits would be advisable, and this change might perhaps properly be accompanied by additional levies upon income derived from securities yielding a fixed return. Additional burdens upon such incomes would not be inequitable in view of the decline in the cost of living that has already occurred, and in view of the more rapid decline that might be expected to follow a downward revision of salaries and wages designed to establish that more balanced relationship of prices that would seem essential to place the demand for additional capital and credit upon a broad and solid foundation.

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#### DISCUSSION ON DR. SPRAGUE'S PAPER.

MR. R. G. HAWTREY: It is a very special pleasure to me to move this vote of thanks on account of the valued friendship with Dr. Sprague formed when I was at Harvard two years ago, also because he is second to none as an expert in this subject, and I might add, thirdly, because he holds a highly important position at the centre of affairs at the Bank of England at the present time.

We have been receiving information straight from the stable, and I must confess I find the information exceedingly disquieting. We have put everything on the horse down to that garment which is proverbially the last resort of the enthusiastic gambler, and we learn that the jockey does not believe that anything he can do has the slightest effect on the result of the race, and that therefore he proposes to pull the horse. That explains why the pound and the dollar have been extremely unstable stable companions.

Dr. Sprague disputes the responsibility of the Central Banks for the price level. The position can be put in a very simple form. The price level expresses a relation between wealth on the one side and money on the other. The Central Bank is the sole source of money; it has absolute control over one term of the relation. It is not gold that controls money, but money that controls the value of gold. To all intents and purposes the only gold market consists in that which is formed by the purchases of Central Banks from one another and from the mines; the rest of the gold market is of a quite subsidiary character. Gold necessarily follows money; the idea that money follows gold is a fallacy. I may say that I quite agree with Dr. Sprague's opinion that there is no scarcity of gold. I believe there is a great redundancy of gold, and after a suitable interval I believe the redundancy of gold, if not duly controlled by the Central Banks, is likely to make itself felt in an inflationary movement.

Dr. Sprague disputes the power of the Central Banks over money; he maintains that the recent fall of prices is explicable on other grounds than scarcity of money. That can be brought to a very simple test. Suppose that in some form or another the fall of prices

is due to non-monetary causes. What does that mean? It means that the fall of prices is due to a fall of costs, and therefore no reduction of wages is involved. Equally, if the fall of prices is due to increased productivity, there is no increase in the burden of debts in terms of human effort. All the difficulties which are shaking the economic foundations of the world at the present time would be a mere fiction.

If that is not so, it is because the fall of prices is not due to natural economic causes such as the fall of costs.

That does not completely dispose of the problem of non-monetary causes. It is well recognized that, quite apart from the reduction of costs in manufacturing industries and so on, there have also been complications caused by the accumulation of big stocks from exceptionally large crops of certain products. Suppose some such cause has been at work; concede for the sake of argument that the price fall has been caused by over-production in some form or another, what does that mean? You have over-production in a certain industry and therefore there follows a contraction of output in that industry. Contraction of output means contraction of incomes, and contraction of incomes in terms of money means contraction of demand for all other products. All other industries are thereupon faced with the same situation as those which originally suffered from over-production, and each, therefore, provides less demand for the products of the others. We come immediately to a vicious circle. Restriction of production means restriction of demand, and therefore requires further restriction of production. That is an illustration of a principle which I have called an inherent instability of credit, and to which Dr. Sprague refers in his paper. The inherent instability of credit turns any cause of depression into a monetary cause in a very short time. The original cause—the over-production of cotton in 1926, of coffee in 1927 or of wheat in 1928—may start by producing a limited depression in the particular industries in which it has occurred, but once started, unless something is done, it is bound to spread and to go on indefinitely gathering force.

It may be replied that it cannot go on for ever. It cannot. Why? Incomes shrink, and as incomes shrink the supply of money becomes more and more redundant. One of the incidental consequences of trade depression is the stagnation of cash balances, so that the process by which incomes shrink may go on a long way without causing the existent supply of money to become redundant. Moreover, as money is spent from balances and goods are sold, there is a tendency for money to be applied to repayment of bank advances, and therefore for a contraction of the monetary supply to go on. Ultimately you come to a hard core of gold. Ultimately you find that contraction of incomes and of currency cannot go further, because the proportion of the gold in bank assets has become so great. What is the moral of that in regard to the responsibilities of Central Banks? Gold is nothing for monetary purposes except an asset of the Central Banks. This same limit can be found if the Central Banks, instead of holding gold, hold something else as an asset. The stage at which the limit is reached, and at which the stock of purchasing power becomes

redundant, can be hastened to an indefinite extent by the Central Banks adding to their assets, and for that purpose earning assets have exactly the same virtue as gold.

Professor Sprague drew a distinction between major and minor fluctuations. His illustrations were exclusively drawn from post-war experience. I should say that the proper distinction is not between major and minor fluctuations, but between fluctuations where credit policy was under the guidance of Governor Benjamin Strong, and other fluctuations. The cases of 1924 and 1927 were cases in which the Federal Reserve System took early action, and therefore the depression was never allowed to develop. On the other hand, if we go back to before the war, we do find a difference between depressions of greater and less severity. There was a difference between the depressions which were of such intensity between 1873 and 1896, when the trend of the price level was downwards, and the relatively mild fluctuations such as occurred between 1896 and 1914, when the trend of the price level was upwards. This is very instructive, because the causes which produced the downward trend of the price level from 1873 to 1896 were very parallel to the causes operating in recent years, the accumulation of gold reserves owing to a change of monetary policy. The replacement of silver by gold in the period 1873-96 supplies a very close parallel to what has been going on in recent years. And the parallel can be pursued further. It occasionally happens that a depression is so intense that the scarcity of money is created not by the unwillingness of bankers to lend, but by the unwillingness of traders to borrow. That has occurred in the past eighteen months, and it occurred in the early 'nineties. After 1893 there was a period when the bank rate was at 2 per cent. for two and a half years. The Bank of England was swamped with gold, and nevertheless, with considerable discrimination and judgment displayed at that time, it made large additions to its open market assets. The result was that at the end of that period of two and a half years, unemployment, which had been as high as 10 per cent., was reduced to 3.3 per cent. I think that is a very instructive precedent. In conclusion I will say that the solution is to be found in the very thing that Dr. Sprague is arguing against, the purchase of assets by Central Banks with a view to flooding the Joint Stock Banks with money, compelling them to find additional earning assets, until demand is revived, the vicious circle is broken, and willing and solvent borrowers are forthcoming because their power to sell goods has improved.

PROFESSOR T. E. GREGORY: I should like first of all to add my own personal expression of thanks to those already tendered by Mr. Hawtrey. I do so with greater pleasure because I must confess that I do not know whether Dr. Sprague is speaking in an academic sense, or whether he is assuming the gloomy responsibilities to be associated with Central Bankers at the present time. I notice that such phrases as "Central Bankers do not believe this" or "Central Bankers are of the opinion that" are rather plentifully bestowed in the paper, and I think it is very important to know whether we are listening to the voices of the Federal Reserve System and of the

Banks of England and France, and also to know a little more clearly precisely where we stand. The most important function of a discussion of this kind is to clear the ground of false distinctions, into which one is almost insensibly driven when one is asked to support or propose a vote of thanks on an occasion of this sort. I think a great part of the difficulty of this particular problem has arisen because one is expected to believe either that everything Mr. Hawtrey says is right, or to believe that everything Dr. Sprague says is right; one has either to be 100 per cent. monetary or 100 per cent. anti-monetary; and, speaking for myself, I am going to protest against this intellectual dilemma into which I am pushed. I find myself in very considerable agreement with Mr. Hawtrey on certain aspects, and with Dr. Sprague on certain other aspects, and I think it is very unfortunate if the public is driven to presume that the whole of the truth must necessarily lie with one or other of these distinguished gentlemen.

Let me begin by pointing out the first of the false distinctions drawn. We are required to assume that if it is true that trade fluctuations are primarily monetary phenomena, therefore the only way we can get out of the muddle is by the Central Banks taking action. It may very well be that the main reasons for fluctuations in the volume of trade and for the existence of the cycle are to be found in mismanagement of the credit system by Central or Commercial Banks. I do not think it follows that you can therefore show that the proper method of overcoming the depression is by means of direct Central Bank action. It may be so, but it does not follow that because I believe that the main cause of the trouble was the action of the Federal Reserve System in 1928, that it must also be true that it is only the action of the Federal Reserve System that can get us out of the difficulty.

It is not true that you cannot overcome the present depression by an adjustment of money and wages; if nothing else will get us out of the depression, that is one way out. But if you regard the world as it is, it is an exceedingly difficult way of climbing out of a situation of this sort. It has not been proved yet, so long as Central Banks have not taken action, that it is necessary to incur great political risks in this way. Also it does not in the least follow that because you can achieve what you want by means of an adjustment of money incomes to the level of prices, that you ought to rely upon that exclusively, even if you assume that the thing is possible. For my own part I refuse to acknowledge that I have to rely entirely on Central Bank action, or on a complete adjustment of money wages to prices. I believe you have to try both, and both simultaneously. There seems to me to be no reason to say that in certain cases and countries no effort must be made to adjust the new prices and wages.

I rather object to the importation of one prejudiced phrase in the discussion. You must all have admired the choice of language Dr. Sprague has adopted in his paper and abstract, but I think he has tried to prejudice the discussion a little by constantly talking about "flooding the market with Central Bank money." Why must you do so? That is not at all necessarily involved in the view that Cen-

tral Banks can, if they wish to do so, assist the recovery by some reduction in market rates and some reduction in earning assets. Why should I be obliged to admit that Central Banks can do nothing? I venture to protest very humbly against the assumption that cheap money is the same thing as flooding the money market. There may be some members of this audience who think that that ought to be done, but I am not one of them. How quickly that credit ought to be provided is a different thing from the question of whether the Central Banks are in a position to do something to improve the situation.

I have never been one who has believed that all that has to be done in order to keep the world straight is to turn the handle at the Central Bank and pump out so much money, and then let everything look after itself. It is quite true that in the several successive up-swings of trade activity one does get these distortions of production of which Dr. Sprague has spoken, and it is to my mind a very desirable thing that that should be emphasized in this country at the present time. We must not tell every producer, "You need not worry, the Bank of England will get you out of your troubles!" That would be a mistake. We can cheerfully admit that *all* of the phenomena of the trade cycle may not be corrected by anything that the Central Banks can do. It is quite clear that while the depression lasts, the number of people whose position is affected increases with every fall in prices. Just as the doctrine of Central Bank action can be carried to excess, so can the other doctrine. I venture to suggest the way in which, in the absence of some unity, depression will go eventually. It may be a general bankruptcy of all debtors, writing down of all debts and starting afresh. I do not suppose in a country of this kind, with enormous liabilities owing to us on the part of other countries, we are really in a position to risk a writing down process of this sort before we have tried a more general policy of greasing the wheels a little.

I have much pleasure in seconding this vote of thanks to Dr. Sprague.

SIR BASIL BLACKETT said that at the end of Dr. Sprague's speech he had found himself (1) noticing that he was a little milder in his speech than in his paper, and (2) looking for some points in it with which he could agree, and he found himself in agreement with two points. He agreed that it was not by monetary means alone that things could be put right, and also that the recovery would have to be planned out; it could not be dealt with piecemeal. With regard to the general doctrine, he found himself in agreement with the last speaker. If Dr. Sprague was to be believed, the solution he looked for in the present difficulties was by the brutal economic adjustments of the last century. If it were necessary to go back to them, surely that represented a great failure of the human mind to live up to the possibilities of the twentieth century, and in any case he believed it would be quite impossible.

As Dr. Gregory had pointed out, the logical conclusion of Dr. Sprague's argument was a clear one—for the debtors to say they were tired and would not pay. Unfortunately things would not take that

simple form, but would in all probability take a very severe political form. They would begin with troubles between farmers and the Church on the question of tithes and be followed up by troubles between Germany and her creditors on the question of reparations, and it might all end in universal chaos.

That there was nothing that Central Banks could do at present seemed to be a doctrine of despair; they must work in co-operation with each other and with their Governments, and they must co-operate also with other financial institutions. Financial policy could not be entirely dictated by the Central Banks without co-operation with other financial institutions, and there must be an attack on other problems at the same time.

To repeat an illustration he had used a few days ago, in the last twenty years Great Britain had succeeded in doubling the number of the feeble-minded by refusing to allow economic social facts to have their full consequence on the people, and by not taking other steps necessary to deal with the other side of the feeble-minded question.

Sir Basil Blackett added his thanks to those already accorded to Dr. Sprague for his interesting address, with which it would be seen he largely disagreed.

PROFESSOR J. H. JONES said that there was nothing so unnatural as a straight line, nothing so difficult as to walk in a straight line; and the only man who attempted to walk so was the one who feared that he might otherwise be suspected of being incapable of doing it. Trade moving in a straight line would be equally unnatural, and in saying that he thought he was saying enough to suggest that he did not fully agree with Mr. Hawtrey.

A few days before he had read an article by Professor Gregory in a supplement to the *Financial News*, and had found himself in strong disagreement with the writer. But he now thought that either he must have misunderstood him or that Professor Gregory must have changed, for his own views had been so admirably expressed by the Professor in his contribution to the discussion that he felt he had nothing useful to add on the subject.

But there was one point in Dr. Sprague's paper which he would like to pursue further. Dr. Sprague had found the major cause of depression to be what he termed disequilibrium, and he would remove such disequilibrium by reducing the wages and salaries of those employed in industries that had not been over-developed. Presumably he would regard it as a pure coincidence that over-production had occurred simultaneously in a large number of industries and had coincided with a particular policy of the Federal Reserve Banks. He would like to ask one question referring to the world problem. As he listened to Dr. Sprague he thought that at some points he was referring to Great Britain, where there was a special problem due to the maladjustment of internal costs and world prices, and at other points to the world as a whole, and particularly to the United States of America. Assuming that the world problem was being considered, not the special British problem,

and also assuming that in consequence of the excessive fall in the prices of (mainly) primary products all countries adopted the policy of reducing wages and salaries in the remaining industries in order to bring about what Dr. Sprague called equilibrium, would not the disequilibrium remain exactly as before? Was not the disparity in prices an inevitable expression (on Dr. Sprague's analysis) of a disequilibrium of production? However much wages and prices were reduced, it would still be found that too much wheat was being grown, that too much copper was being produced, and that too much rubber was finding its way into the market. This would at any rate be true unless, through a reduction in wages and costs in other industries, the demand for primary products was increased. During the process of reduction, however, such demand, so far from increasing, would actually be reduced. When the cycle had been completed it would be found not merely that wages and costs had been reduced in relatively active industries, but also that they had been proportionately reduced in the over-developed industries. The old relationship of prices would be restored, on a lower price level and revealing once more the evil of over-production—if, that is, we accepted Dr. Sprague's analysis of the present depression.

That analysis suggested that the remedy was not to be sought in adjusting relative costs and relative prices, which were themselves merely expressions of a more fundamental disequilibrium. The stress laid by Dr. Sprague upon disequilibrium in the field of production suggested that the sort of over-development from which the coal-mining industry was suffering was characteristic of a great variety of world industries and constituted the root cause of the world depression. This view, with which he strongly disagreed, was also brought out by Dr. Sprague in a recent address to the Society of Incorporated Accountants, in which he pointed out that it was necessary to control, through the medium of banks and other financial agencies, not only the amount of credit but also the direction of credit. The implication of such a financial policy was that the primary evil was misdirection of production, and the chief need a reduction in the relative producing capacities of the overgrown industries. If that were so, Professor Jones failed to see how the result could be achieved by a process of wage reductions, which would merely create a vicious circle. The defence of such reductions lay in the analysis rejected by Dr. Sprague.

PROFESSOR CLAY wished to associate himself with the previous speakers and to offer his thanks to Dr. Sprague, the more so that, unlike previous speakers, he found himself in general agreement with the paper. He thought that in his public utterances Dr. Sprague laid himself open to attack by his economy of statement, and that he would not deny that the monetary aspect of trade fluctuations was important, or that a Central Bank policy should co-operate with other means of alleviating that depression. He would not deny that a Central Bank policy could, in Professor Gregory's phrase, "grease the wheels of the machinery." What Dr. Sprague would deny was the suggestion that by merely greasing the wheels of the machine,



the machine could be induced to climb the extremely steep gradient with which industry had been faced since the war.

The general cause of industrial depression was disequilibrium. Monetary policy could be subsumed under this general cause, and was important only for the reason that it was a principal cause of loss of equilibrium. In Professor Clay's opinion it was an important cause, but it was not the only influence that caused a loss of equilibrium. Obviously in a world community based on exchange there was a constant danger of loss of equilibrium. It could be illustrated generally by the tendency of industry as a whole in any period of expanding trade to overdo the expansion. If everyone went on making the same things in increasing quantities, a point would be reached at which the expectations of the producers would be disappointed, and the consumer would not put a value on the things produced that would cover the costs of production. This was a simple inference from the law of diminishing utility. Nor was there any difficulty in explaining this simultaneity of trade depression. If it happened that there had been over-production of wheat, coffee, rubber, tin, and copper, the extent of depression in these industries would react immediately upon the industries dependent upon them for a market. It was no matter for surprise to have an exceptional extent of dislocation and consequent depression following the war. Obviously by going to war and diverting industry from its normal development some such outcome must result, and one of the chief values of Dr. Sprague's paper was its analysis of the difficulties of the situation in which the world found itself as a result of the war which only ended thirteen years ago.

Professor Clay said that he wished also to disregard the warning against unnecessary distinctions, and to stress two distinctions that seemed to him necessary.

The first was the distinction between wages and wage rates. No one wanted to reduce wages if it could be avoided, but he was not satisfied that a great many wage rates could not be reduced in such a way that the earnings of workers would be increased. In the cotton industry nearly as many workers as before the war were trying to get a living out of an industry whose output was half what it was before the war. The opportunities of wage-earning of these workers might well be increased by modifying piece-lists, many of which were forty and fifty years old.

Sir Basil Blackett had deprecated drawing any distinction between Central Banks and Commercial Banks. This was the second distinction he wished to draw. It was absolutely essential to any understanding or treatment of the present depression. All the speakers hitherto had refused to face Dr. Sprague's distinction between the amount of credit and the use of credit. The accurate direction and use of credit was in the hands of the commercial banks and issuing houses and other agencies directly in touch with users of credit. It was quite possible that a Central Bank could increase the volume of credit, and that yet a deflationary effect would follow, if the Joint Stock banks were unwilling to use the increased volume and restricted advances to their clients through distrust of the con-

dition of industry. Again, he would suggest, purely as a theoretical proposition, that it was quite possible that Joint Stock Banks, having carried so many bad risks through the good years, might find it difficult to carry good risks through the bad years.

Whatever the Central Banks did, there were bound to be a lot of liquidations of firms which the banks had financed since 1921 under the impression that the depression in British industry was temporary. He agreed with Dr. Sprague less as a result of special theory than as a result of particular enquiries. Wherever he went he got complaints of the extent to which the Joint Stock Banks had extended credit to firms that had no justification, while firms that might otherwise have expanded had been handicapped by this uneconomic competition and found themselves unable in some cases to use to the full their resources in capital. As recently as a fortnight ago an old-established firm of Manchester merchants had returned two-thirds of its capital to its shareholders because it could not use it. There had been several instances of this lately in the depressed spinning industry. In all the depressed industries it was misdirection of credit, not shortage, that had perpetuated depression. This was important, because it would be found when recovery came, it would come more in the development of new rather than the recovery of old industries. That development could take place only if there was a far-sighted and discreet use by the Joint Stock Banks of such credit resources as the country possessed, whether these were big or little.

MR. E. M. H. LLOYD said Professor Gregory had referred to various false distinctions that had been drawn, but he thought that an excessive distinction might be drawn between the views of Dr. Sprague and Mr. Hawtrey. Mr. Hawtrey did not claim that monetary measures were a panacea for all ills, nor did Dr. Sprague appear to be a whole-hog member of the anti-monetary school. He was 50 per cent. with the monetary school; for he agreed that it was within the power of the Central Banks to prevent inflation and to take steps to prevent a rise of prices getting out of hand. That was half the doctrine of the monetary school, and perhaps more than half of what was implied in the resolution of the Genoa Conference, that it was within the power of the Central Banks to prevent undue fluctuations in the price of gold. It was not quite clear what was Dr. Sprague's view about inflation through open market operations on the part of the Federal Reserve System. Did he hold that such action by the Federal Reserve System could not bring about a rise of prices? He had said that in his view it was impossible for the Central Banks to influence the prices of those commodities which were most depressed at the present time, and it might be assumed from that, that he was denying the possibility of deliberate inflation. Alternatively, if he did not take that view, would he say that this policy of deliberate expansion of credit should be rejected on the ground of its possible pernicious results? If so, then it became a choice of evils. No one would maintain that expansion of credit by Central Banks would cure all troubles and would not involve certain injustices and all the other undesirable results of a general rise in

prices. But he would like to put it to Dr. Sprague that the issue was really a choice between two evils, either to maintain the present level of wholesale prices and attempt to bring about all those adjustments which he had shown to be necessary, or to take drastic steps through the expansion of credit by the Central Banks to raise the level of prices even at the risk of some undesirable results?

Turning from the general to the particular, he would like to ask why the Federal Reserve System during the beginning of the depression increased its holdings of Government securities from 140 million to 600 million dollars, and why had it not increased its holdings of Government securities from June 1930 to the present date? It might be said that the Federal Reserve System thought that increasing earning assets in this way might promote revival, but that by June 1930 they had decided it had no such effect. If that were true they were adopting the view that expansion of credit by open market operations could have no effect on prices. But he had heard from Dr. Sprague that they stopped because they found this led to the purchase of large quantities of bonds by the member Banks, and that among these there were some worthless bonds. That might be one of the necessary undesirable results of an expansion of credit by the Central Banks. But did Dr. Sprague argue that it was necessary to prolong the trade depression and jeopardize the world's economic structure in order that the member Banks of the Federal Reserve System might be protected from the risk of buying worthless bonds?

SIR JOSIAH STAMP said that when he was a boy at school they said there were five puddings; they were all the same pudding really, only they had different names and slightly different flavourings. It was the same in this problem; they were all using the same ingredients, but putting them in in a different order and using different proportions. Professor Gregory put his finger on a very important point which was necessary to clarify the discussion. He would put that point more crudely and say it did not follow that the way into the trouble was necessarily the way out. It was easy to get into serious trouble by putting the foot on the accelerator instead of the brake, but the way out was not by reversing the process, but by a convalescent home. He would therefore agree very largely with Dr. Sprague's position as to the present inefficacy of many monetary remedies. At the present time that stage of monetary salvation had been passed, though it was necessary to be ready, the moment the situation permitted, to take advantage of monetary ease. He had less agreement with Dr. Sprague's diagnosis of the way in which the countries had become involved in their troubles. There were many causes to which Dr. Sprague attached great importance, but they did not become operative and important until there was some serious underlying trouble. Many a house would stand well on its foundations in ordinary circumstances, but revealed weakness when there was an earthquake. Many of these elements of weakness were always there, but did not seem to be "causes" until thoroughly disturbed by something large and underlying. The more society reckoned upon a régime of stability, the more it tended to make its position rigid,

and the worse the trouble when stability did not happen. This tremendous world disturbance was acting against structures of brick, not of elastic, and it was because of this that many weaknesses that would not otherwise be causes became causes. Many of these maladjustments of production, some proceeding apparently evenly, would be sufficiently corrected by normal forces of the direction of new supplies of capital into the most eligible and away from the least without making world catastrophes at all. One had only to construct an index number in terms of commodities other than gold, such as wheat, metals, etc., and show the relatively small fall in prices which resulted, in order to realize that there was relative constancy, and that lack of equilibrium between different types of production was not in itself sufficient to cause a heavy general fall in prices. They must have underlying causes, and he believed these underlying causes to be of a monetary character.

To revert to the horses: it was commonly said that the cause of this trouble was that the gold horse lagged behind the production horse, another said the trouble was that the production horse had forged ahead of the gold horse—really two ways of varying the same thing. There was, however, a strong *prima facie* challenge for the people who urged that the monetary factors were not the cause of getting into the trouble. If there had not been this particular maldistribution of gold, and it had been distributed in a different way, was it urged that the particular price movements and policies at the respective banks would not have been any different? If not, let the maldistribution be multiplied by ten and then the question be asked again. If it was still ineffective as a cause, then surely gold did not matter at all—it might as well not exist. What became of the elaborate results of ratio? The things that appeared to be causes in one sense of the word had largely become so because of the trouble in the underlying disturbances of the main basis of the credit system.

Sir Josiah Stamp expressed himself in agreement with so much that Professor Gregory had said that it was hardly necessary to repeat it; he would merely say that a useful distinction between major and minor fluctuations was that the major fluctuations were those that got beyond the power of money influences to put right; the minor fluctuations were the aggregate miscalculations of business men that were corrigible by money policy. When there was a major fluctuation the situation got beyond the immediate power of money, as it was now, and something more drastic along other lines must be done. The importance of having abundant supplies of cheap money all ready for the recovery must not be minimized, because the moment the opportunity arose it must be there if the recovery were to proceed. The power of money in the ultimate recovery must not be minimized.

Sir Josiah Stamp said he had heard nothing to shake him in his belief that one of the main original reasons for getting into the trouble had been the inability to maintain the basis of credit and gold distribution by international monetary science to match national needs and prevent unnatural differences or strains of money rates in particular places.

The following communication was received from Mr. R. GLENDAY after the meeting:—

Both prior to Great Britain's return to the gold standard in 1925 and in the crisis year of 1929, grave apprehensions were officially expressed by industry regarding the trend of world monetary affairs. The somewhat striking confirmation which predictions made on those two occasions has received in subsequent events, suggests that an analysis of the events of the post-war period from an industrial angle may possibly throw light on the conflict between the two economic schools of thought at present contending regarding the part played by monetary policy. The industrial approach to the problem differs fundamentally from the economic in that industrialists are unable to regard "stability," whether of money or prices, as the ideal to be aimed at. Just as we cannot be said to enjoy physical peace until we are physically dead, so it is true that an industrial system cannot in a practical sense enjoy the blessing of economic stability unless it is, economically speaking, dead. For so long as progress is going on the price level can never be truly stable. There must always be forces pulling it—and keeping it—out of adjustment.

The best that we can hope to secure is that the pull of progress is not too violent or uneven; but pull there must be if industrial evolution is to go on. Similarly, saving and investment must never exactly balance. Investment must always be moving a little ahead.

The trouble is that these two things tend to get too far out of adjustment, with the result that sooner or later the march of progress is brought up with a jerk by the Banking System, which performs the useful function of stopping the process before it gets to the point beyond which recovery is impossible, as used to happen before the modern gold standard came into being.

Industry's ideal is orderly progress, not stability. Business experience shows that orderly progress, whether of an individual firm or an industry, is only possible if there is, working ahead of current operations, a production plan and a marketing programme preparing the way for future expansion. I may instance the American Telephone and Telegraph Company, which is reputed to work upon a twenty-year plan of future development, with the first five years of the twenty definitely budgeted for.

Now, while at first sight it may seem bizarre to suggest that before the war the finance houses and investment institutions of the City of London were in essence engaged in operating a similar sort of plan—though on a grander scale—an examination of the detailed working of the pre-war system of international trade does, I suggest, reveal something closely approximating to it.

The gold standard was the vital link assisting to keep the balance between production and consumption in the main world commodity markets at all stages of the plan, and preventing long-term development in any one direction getting too far ahead. On this view, the difficulties of our post-war situation are attributable to the circumstance that, (1) the war destroyed the pre-war plan of orderly progress so completely that it has proved impossible to restore it; and, (2) that the temporary handing over of the sceptre of financial authority to the

United States has meant that the gold standard has been in part diverted to foster a development plan along American lines, instead of being recombined in furtherance of a common international plan.

I may interrupt to observe that I have singled out the United States not because hers is the sole responsibility, but because—owing to her enormous internal market—she has been uniquely able to superimpose on the international plan a local internal plan of her own. This is confirmed by the circumstance that, even before the war, the United States enjoyed independent local secondary business cycles at intervals roughly midway between the major international movements; a failure to appreciate this may possibly account for under-estimates of the duration of the present depression by American forecasters.

British Free Trade policy contributed to the orderly working of the pre-war plan by assisting prices to conform to certain basic essentials of long-term progress.

(1) Orderly production and marketing of consumption goods over a period of years is only possible if these are marketed at prices which are gradually falling over the period. If prices generally are rising owing to some common monetary cause, this fall need be a relative one only. The short explanation of the need for this fall is that wages and incomes change but slowly over a period of years, and consequently they can only be made to buy more goods if those goods are sold at cheaper prices.

If at any period during the plan we interfere by temporarily increasing the purchasing power of consumers by, say, over-extension of instalment finance, the first thing that will happen is that producers who have been budgeting for falling prices *at that stage* will make larger profits than they anticipated. If this continues, other producers will come into the field, and this will push costs of production up until ultimately the margin of profit may be almost destroyed. The final result is general over-production, coupled with prices which are unremunerative to producers and beyond the capacity of consumers to pay, once the temporary inflation of their purchasing power ceases. An important secondary effect is that preparations in process for making goods at still more economical prices at a *later stage*—an essential feature of a long-range production plan—will be interrupted, if not abandoned.

(2) The second essential relates to capital development, *i.e.* the starting of new industries, the exploitation of new inventions and the development of new markets. The rule here is that this work also must be planned over a period of years in such a manner that the products to which it gives rise can be marketed, either at gradually falling prices, or in such a way as to displace in more or less orderly manner existing goods, inventions, and markets which become obsolescent. The short explanation in this case is that as the total purchasing power changes but slowly (except during periods of inflation), "new" products can only be sold in growing quantity if they are substituted for "old," or if both are sold at correspondingly lower prices.

A temporary inflation of credit during any year of this part of the

plan leads to over-development of equipment of the type proper to that stage of the plan, to the detriment both of orderly progress during subsequent years and the maintenance of current stability. Having regard both to the fact that such movements, once started, tend to grow cumulatively and that the aggregate fund of money is more or less limited, periodic crises resulting in the hold-up of the long-range plan of development are not surprising. The extent of the hold-up will depend on the circumstances in each case. The effect of money inflation on such a plan is to encourage extension forward of planning, while money deflation leads to a contraction. Inflation also has what may be termed the "static" effect of facilitating the liquidation of past debts and mistakes; this accounts in the main for its popularity as a nostrum.

On the above view the first remedy for a depression is to prune off the excessive growth of the previous boom and allow the time for the correction of maladjustment. To encourage new investment before this has been done merely bolsters up the *status quo*, and postpones a fall in rates of interest to the level appropriate to a resumption of orderly progression in the next stage of the long-term plan. If maladjustment has gone so far that recovery is impossible, then to judge by past experience a resort to inflation may avert collapse.

But inflation is not always as simple in operation or speedy in result as is commonly supposed. Taking the period 1890-96, when conditions were in many respects very similar to those of the present day, I find that the inflation which began with the expansion of the gold holding of the Bank of England in 1893-96 took some two years to produce a material effect on rates of interest, home investment, and the prices of constructional materials, and a further two years before that effect reached its maximum intensity *via* a domestic building boom and the South African War. And it took nearly twenty years for this effect to work itself out in general prices and international investment, while the inflation responsible for the present breakdown of consumption industries in the United States was set going some five to ten years ago.

DR. SPRAGUE, in reply, said that the course of the discussion illustrated that division of opinion regarding trade fluctuations to which he had called attention at the outset of his paper. Apparently, there was only agreement on the disastrous effect of an extreme decline in prices and the urgent need for a reversal of the movement in the near future. Mr. Hawtrey and Mr. Lloyd had presented the pure monetary view of the causes of depression, insisting that it might have been escaped had Central Banks issued credit more freely and that it could be overcome at any moment were that course to be adopted. As his paper had been largely a criticism of this view, a reply seemed unnecessary, as it would be hardly more than a summary of the paper itself.

Other speakers, aside from Professor Clay, whose support he greatly appreciated, had taken a middle course, differing more as to causes of the depression than as to remedies. The President of the

Society, Sir Basil Blackett, and Professor Gregory all seemed to hold that the present depression was mainly due to monetary causes. No one of them, however, had indicated precisely by what monetary means the depression might have been escaped. Dr. Sprague said he would associate himself with this view if by monetary means they had in mind the exercise of greater restraint during the years following the re-establishment of currencies upon a gold basis. He believed that the present depression would have been far less severe if a somewhat smaller amount of foreign money, especially short money, had been employed in Germany and if a somewhat smaller volume of capital had been invested in South America, Australia, and perhaps some other parts of the world. It would have been advantageous also had more progress been made during those years in England in rationalization and in the liquidation of many over-extended financial positions. And finally, as he had already pointed out in his paper, drastic action by the Federal Reserve System in 1928 would have been of decided advantage.

Differences of opinion between himself and many of those who discussed the paper regarding appropriate remedies for the present depression seemed to him perhaps less extreme than his critics supposed. He was inclined to think that they had overlooked one important word in his statement of what he believed Central Banks might do. He had asked the rhetorical question: What might the Central Banks alone do? and had answered it by saying that he believed that they could do comparatively little. This did not imply that Central Banks in co-operation with other agencies could do little. If other influences are working in directions which are calculated to bring about a recovery, then expansion of credit by Central Banks may be considered to be not only helpful but essential. He would, however, emphasize once more that in the absence of such influences, and particularly if influences are at work tending to maintain unsound positions, then liberal credit by Central Banks may do more harm than good.

In conclusion, Dr. Sprague wished to repeat once more that a policy designed to reach a closer approach to equilibrium in prices does not imply bringing down the prices of all goods to the level of those which have experienced the most extreme fall, nor does it contemplate the stabilization of prices at the present low level, but rather the establishment of a firm foundation for an upward movement of prices in the near future.

As a result of the Ballot taken during the meeting the candidates named below were elected Fellows of the Society:—

Colin Grant Clark, B.A.

Marjory Hope McLellan.

Har Prasad Khandelwal, B.Com.

Nowsherwan Asbandiar Mehrban.



## MISCELLANEA.

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## THE DISTRIBUTION OF THE ESTIMATED COEFFICIENT OF VARIATION.

By A. T. MCKAY, M.Sc., of the British Boot, Shoe, and Allied Trades Research Association.

§ 1. IN certain problems that arise in the practical application of statistics the coefficient of variation proves to be of as much importance as the absolute values of the mean and standard deviation. Since, in general, the parameters of an infinite population are unknown, we have to be content with estimates made from sampling, so that it becomes necessary to find the distribution of the estimated proportional coefficient of variation.

§ 2. Let a normal population be defined as usual by the parameters  $m$  and  $\sigma$ , then the distribution of the mean of random samples of  $n$  is given by :

$$\frac{\sqrt{n}}{\sqrt{2\pi}\sigma} \cdot e^{-\frac{n}{2\sigma^2}(\bar{x}-m)^2} d\bar{x} \quad . \quad . \quad . \quad . \quad . \quad (1)$$

The best estimate of the standard deviation is  $s = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n-1}}$ , and this is known to be distributed as :

$$\frac{(n-1)^{\frac{n-1}{2}} \cdot e^{-\frac{s^2}{2\sigma^2}(n-1)} \cdot s^{n-2} \cdot ds}{\sigma^{n-1} 2^{\frac{n-3}{2}} \cdot \Gamma\left(\frac{n-1}{2}\right)} \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The compound probability of an  $\bar{x}$  between  $\bar{x}$  and  $(\bar{x} + \delta\bar{x})$ , and simultaneously of an  $s$  between  $s$  and  $(s + \delta s)$  is therefore :

$$q = \left[ \frac{(n-1)^{\frac{n-3}{2}} \sqrt{n}}{\sqrt{2\pi} \cdot 2^{\frac{n-3}{2}} \Gamma\left(\frac{n-1}{2}\right)} \right] \cdot e^{-\frac{1}{2\sigma^2}\{n(\bar{x}-m)^2 + (n-1)s^2\}} s^{n-2} \cdot \delta\bar{x} \cdot \delta s \quad (3)$$

Now the best estimate of the proportional coefficient of variation is  $v = s/\bar{x}$ , so, changing the variable and writing the quantity in square brackets equal to  $K$ , we find the compound probability of an  $\bar{x}$  between  $\bar{x}$  and  $(\bar{x} + \delta\bar{x})$ , and a  $v$  between  $v$  and  $(v + \delta v)$  is :—

$$K v^{(n-2)} \bar{x}^{(n-1)} e^{-\frac{1}{2\sigma^2}\{n(\bar{x}-m)^2 + (n-1)v^2\bar{x}^2\}} \delta\bar{x} \cdot \delta v \quad (4)$$

If, however,  $m > \frac{3\sigma}{\sqrt{n}}$ , i.e. the true coefficient of variation, is less than

$33\sqrt{n} \%$ , negative values of  $\bar{x}$  occur less than  $1\frac{1}{2}$  times in 1000 trials. Since it is only the distribution of the absolute value of  $v$  which is of interest, it is necessary to integrate (4) over the range of absolute values of  $\bar{x}$ . No serious error occurs, therefore, by integrating (4) from  $\bar{x} = -\infty$  to  $\bar{x} = +\infty$ , when the above proviso obtains. Hence we have :—

$$p_v \cdot \delta v = K v^{n-2} e^{-\frac{m^2}{2\sigma^2} \cdot \frac{n(n-1)v^2}{(n+n-1v^2)}} \int_{-\infty}^{\infty} x^{n-1} e^{-\frac{(n+n-1v^2)}{2\sigma^2} \left(x - \frac{nm}{n+n-1v^2}\right)^2} dx \cdot \delta v \quad (5)$$

If now the term  $x^{n-1}$  is expanded in the region of  $x = nm/(n + n - 1v^2)$  by Taylor's Theorem, we readily deduce :—

$$p_v \cdot \delta v = \frac{K(nm)^{n-1} v^{n-2} \sqrt{2\pi} \cdot \sigma \cdot e^{-\frac{m^2}{2\sigma^2} \cdot \frac{n(n-1)v^2}{(n+n-1v^2)}}}{(n + n - 1v^2)^{\frac{2n-1}{2}}} \cdot \delta v + Q(v) \cdot \delta v \quad (6)$$

where  $Q(v)$  compensates for the remainder after the first term in the Taylor's expansion. Writing  $t^2 = \frac{m^2}{\sigma^2} \cdot \frac{n(n-1)v^2}{(n+n-1v^2)}$  we find :—

$$p_v \delta v = \frac{t^{n-2} \cdot e^{-t^2/2}}{2^{\frac{n-3}{2}} \cdot \Gamma\left(\frac{n-1}{2}\right)} \delta t \cdot \left(1 - \frac{\sigma^2 t^2}{nm^2}\right)^{\frac{n-2}{2}} + Q_1(t) \delta t \quad (7)$$

or separating the first term of the Binomial expansion :

$$p_v \delta v = \frac{t^{n-2} \cdot e^{-t^2/2}}{2^{\frac{n-3}{2}} \cdot \Gamma\left(\frac{n-1}{2}\right)} \cdot \delta t + Q_2(t) \cdot \delta t \quad (8)$$

where  $Q_2(t)$  has absorbed the neglected terms and  $Q_1(t)$ . Integrating equation (8) over the whole range of  $v$  from 0 to  $\infty$  we have :—

$$1 = \frac{1}{2^{\frac{n-3}{2}} \cdot \Gamma\left(\frac{n-1}{2}\right)} \int_0^{m\sqrt{n}/\sigma} t^{\frac{n-2}{2}} \cdot e^{-t^2/2} dt + \int_0^{m\sqrt{n}/\sigma} Q_2(t) \cdot dt. \quad (9)$$

or

$$\int_0^{m\sqrt{n}/\sigma} Q_2(t) \cdot dt = \frac{1}{2^{\frac{n-3}{2}} \Gamma\left(\frac{n-1}{2}\right)} \int_{m\sqrt{n}/\sigma}^{\infty} t^{\frac{n-2}{2}} \cdot e^{-t^2/2} \cdot dt. \quad (10)$$

The function on the right-hand side of equation (10) is a well-known Incomplete Gamma Function, and by reference to numerical tables or otherwise, it may be shown to be quite small when  $m > 3\sigma$ . We conclude, therefore, that the second term in equation (8) is negligible, and that the range for  $t$  can be taken as 0 to  $\infty$ , provided  $m > 3\sigma$ . We have then that the probability of a value of  $t^2 \gg \chi^2$  is

$$P_{n-1} = \frac{1}{2^{\frac{n-3}{2}} \Gamma\left(\frac{n-1}{2}\right)} \int_x^{\infty} e^{-\frac{r^2}{2}} \cdot r^{n-2} \cdot dr \quad (11)$$

This latter is Dr. Fisher's  $\chi^2$  integral, and in his phraseology we may say that  $\frac{m^2}{\sigma^2} n(n-1)v^2/(n + n-1v^2)$  is distributed as  $\chi^2$  with  $(n-1)$  degrees of freedom, provided the coefficient of variation of the population is less than 33 per cent.

It may be noted that the restriction of the method to a population with a coefficient of variation of less than 33 per cent. is rather stringent, but reference to a table of the  $\chi^2$ -integral will readily indicate to what extent it may be removed.

§ 3. In order to gain confidence in the applicability of distribution theories to actual data, the author frequently conducts numerical sampling experiments. In the hope that other students of statistics will be interested in the results of such a procedure, the following investigation is submitted.

A hundred samplings of 5 were selected at random from a nearly normal population having a coefficient of variation of 13.94 per cent. The table below embodies the various results.

Considering that the population of 100 sets is quite small, the agreement between the observed and theoretical frequencies is extremely good; this is confirmed by the application of Pearson's Goodness of Fit test, which yields a probability of usualness of 0.73.

§ 4. In conclusion, I should like to express my thanks to the Council of the British Boot, Shoe, and Allied Trades Research Association, in whose laboratories this work was done, for permission to publish the paper.

$t^2$ .	Observed Frequency.	Calculated Frequency.
0-2	25	26.4
2-4	39	33.0
4-6	21	20.7
6-8	7	10.7
8-10	3	5.2
10-12	2	2.3
12-14	1	1.0
14-	2	0.7
	100	100

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## RECENT ADVANCES IN MATHEMATICAL STATISTICS.

By J. O. IRWIN, M.A., D.Sc.

*(Division of Epidemiology and Vital Statistics London School of Hygiene and Tropical Medicine.)*

THE present article is an attempt to call attention to such advances as were made in Mathematical Statistics in 1930. Reference is made to one or two papers which appeared at the end of 1929, but the 1931 literature will be reviewed in a subsequent article.

In going through the mass of mathematical literature now appearing, we are naturally attracted by new ideas, and in this connexion a paper on "Inverse Probability," by R. A. Fisher, (A13), may be cited. The object of this paper is to show that there is a type of inverse probability inference which can be made without any assumption about the nature of the "*a priori*" distribution of the quantity in which we are interested.

For example, if from a sample of given size we have determined a correlation coefficient  $r$  (the correlation in the population sampled being  $\rho$ ), we may from  $r$  determine a value  $\rho_5$  (which we may call the fiducial 5 per cent.  $\rho$ ) such that if  $\rho_5$  were the population value,  $r$  would be its lower 5 per cent. point. Suppose we have hit upon a rather unlikely value of  $r$ , so that  $r$  is less than the true lower 5 per cent. point, then it will clearly follow that  $\rho_5$  will be less than  $\rho$ . But there is a chance of 1 in 20 that  $r$  should be less than the true 5 per cent. point, therefore there is a chance of 1 in 20 that  $\rho_5$  will be less than  $\rho$ , or that  $\rho$  will be greater than  $\rho_5$ . So that, without any assumptions whatever about the "*a priori*" distribution of  $\rho$ , we may assert that there is a 1 in 20 probability of it being greater than a certain quantity  $\rho_5$ , which is immediately calculable from the sample, but whose value will vary from sample to sample.

Similarly, we can calculate, from any sample, fiducial decile values of  $\rho$  ( $\rho_{10}, \rho_{20} \dots \rho_{90}$ ), and assert that if we take repeated samples, the true  $\rho$  will fall with equal frequency in the compartments so formed. The position of the bounding lines of the compartments will, of course, vary from sample to sample. Thus, by making our inverse inference relative to the sample instead of absolute, we can free it from all the difficulties bound up with the assumption of "equal distribution of ignorance" or other arbitrary assumptions about the nature of the "*a priori*" distribution.

A number of papers deal with the calculation of the moments or semi-invariants of the sampling distributions of moment functions.

There is a wide field of statistical problems in which the population

sampled is rightly considered to be infinite; indeed, in biological problems this would seem almost always to be the correct hypothesis. In this field, the calculation of the semi-invariants of the sampling distributions of higher moment functions has received very detailed attention from R. A. Fisher and J. Wishart. In a paper published in 1928 (C6) Fisher gave rules for determining the semi-invariants of the sampling distributions (in sampling from an infinite universe) of what he calls cumulative moment functions or cumulants. These cumulants are, in fact, estimates of the population semi-invariants made from the sample, and so adjusted that their mean values in all possible samples are these population semi-invariants. He developed an elegant combinatorial procedure for the calculation of the semi-invariants, a procedure which was much facilitated, indeed only made possible, by the choice of cumulants instead of semi-invariants or moments as the fundamental quantities. Formulæ were listed up to the tenth order (with a few twelfth-order formulæ in addition), and a proof by means of symbolic operators was given of the generality of the procedure.

In a paper published in *Biometrika* (A41) Wishart makes use of Fisher's rules to develop certain higher order results for the normal case, which are required in order that the first four moments of the sampling distribution of the Pearsonian  $\sqrt{\beta_1}$  and  $\beta_2$  may be determined as far as terms of order  $\frac{1}{n^3}$ , where  $n$  is the size of sample. The application to the distribution of  $\sqrt{\beta_1}$  and  $\beta_2$  is made by E. S. Pearson (A22) in a paper immediately following Wishart's. But so rapidly does research proceed that we find Fisher (A12), in a paper published a little later, giving (for samples from a normal population) the exact values of the first three even moments of  $\gamma$ , a quantity essentially equivalent to the Pearsonian  $\sqrt{\beta_1}$ , but defined by means of cumulants instead of moments.

If  $k_1, k_2, k_3, k_4, k_5$  are Fisher's first five cumulants, we have

$$k_1 = \frac{1}{n} S(x)$$

$$k_2 = \frac{1}{n-1} S(x - k_1)^2$$

$$k_3 = \frac{n}{(n-1)(n-2)} S(x - k_1)^3$$

$$k_4 = \frac{n^2}{(n-1)(n-2)(n-3)} \left[ \frac{n+1}{n} S(x - k_1)^4 - \frac{3(n-1)}{n^2} \{S(x - k_1)^2\}^2 \right]$$

$$k_5 = \frac{n^3}{(n-1)(n-2)(n-3)(n-4)} \left[ \frac{n+5}{n} S(x - k_1)^5 - \frac{10(n-1)}{n^2} S(x - k_1)^2 S(x - k_1)^3 \right]$$

where  $x$  represents the variate and  $n$  is the size of sample.

$\gamma$  is then defined by

$$\gamma = k_3 k_2^{-3/2}$$

while we may take

$$\delta = k_4 k_2^{-2}$$

$$\epsilon = k_5 k_2^{-5/2}$$

$\delta$  is then essentially equivalent to the Pearsonian  $\beta_2$ .

Not only does Fisher determine the exact values of the first three even moments of  $\gamma$ , but also the exact values of the simpler non-vanishing moments of the simultaneous distribution of  $\gamma$ ,  $\delta$ ,  $\epsilon$ .

The method used by Fisher consists in the development of recurrence relations "expressing the ratios ( $\gamma$ ,  $\delta$ ,  $\epsilon$  . . .) from a sample of  $n$  in terms of the corresponding ratios of a sample of  $(n - 1)$  observations, and of a parameter distributed independently in a known distribution. Theoretically all properties of the general distribution could be obtained from these relations in conjunction with a study of samples of 3, 4, 5 . . . observations." Observing that the simpler non-vanishing moments of the simultaneous distribution of the ratios  $\gamma$ ,  $\delta$ ,  $\epsilon$  . . . are simply related to the corresponding moments of the distribution of  $k_3$ ,  $k_4$  . . . given in a previous paper, Fisher is led on to an application of a method of symbolic operators which confirms the generality of the relationship found. "The moments of the one distribution may thus be inferred directly from those of the other for which the combinatorial procedure is available."

In the current *Biometrika* (A23) E. S. Pearson makes use of Fisher's exact expressions to check his previous approximations, and finds that the values they gave were substantially correct.

We thus have a confirmation of his conclusion that the distribution of  $\sqrt{\beta_1}$  (in sampling from an infinite normal population) is a symmetrical leptokurtic curve which tends to the normal fairly rapidly as  $n$  increases. For rough purposes it may be taken as normal with a standard error of  $\sqrt{\frac{6}{n}}$  for  $n = 100$ . The distribution of  $\beta_2$  is an extremely skew curve at  $n = 100$ , and even when  $n$  is 1000 can hardly be considered normal. The use of the approximate instead of the exact expressions in the table which E. S. Pearson has given of the 5 per cent. and 1 per cent. points of  $\beta_1$  and  $\beta_2$  will not materially affect the result. But he rightly remarks that the amount of approximation involved in his assumption that the distributions are Pearsonian curves with the correct moment coefficients cannot be ascertained until the actual frequency laws for  $\sqrt{\beta_1}$  and  $\beta_2$  have been found.

While the hypothesis of sampling from an infinite population is perfectly adequate over a wide field, there are some problems, notably

in economic statistics, which demand limited population theory; so that it is no surprise to find that in the current literature considerable attention has been devoted to this problem.

Thus in the first and third numbers of the *Annals of Mathematical Statistics*—the new enterprise of the American Statistical Association, to which we accord a hearty welcome—there is an editorial article (A10) in which some problems of sampling from a limited population are considered. Expressions are given for the first eight moments of the sample totals about their sampling mean, from which the moments of the sample means about the mean of the population follow at once.

The writing down of these moments is facilitated by the use of "sampling polynomials." The  $n$ th sampling polynomial is defined as follows

$$P_n(\rho) = D_x^n \log (\rho e^x + 1 - \rho) \Big|_{x=0}.$$

After the evaluation of this expression  $\rho^i$  is replaced by  $\rho_i$ , where

$$\rho_i = \frac{r(r-1)(r-2) \dots (r-i+1)}{s(s-1)(s-2) \dots (s-i+1)}.$$

For example, the fifth moment about their own mean of the sample totals is given by

$$\mu_{5..} = 5! \left\{ P_5 \frac{s\mu_{5..}}{5!} + P_3 P_2 \frac{s^2\mu_{3..} \mu_{2..}}{3! 2!} \right\}$$

where  $\mu_{r..}$  is the  $r$ th moment of the population about its mean,  $r$  is the number of individuals in the sample, and  $s$  the number in the population. Similar expressions hold up to  $\mu_8$ , but the author has not been able to justify the use of the sampling polynomials beyond this stage. These results are used to deduce corresponding formulæ for the moments of sample  $m$ th moments about the origin of the parent population. The author also deduces the well-known formulæ for the mean and standard deviation of the variance in sampling from a limited population. He does not claim that his results are new, merely that they are presented in a simple form.\* Indeed, they follow from the much more general work of Tschuprow; the first four moments of the mean in sampling from a limited population are explicitly stated by Tschuprow (C5), as are also the mean and standard deviation of the variance.

The former results had also been given earlier by Isserlis (C2 and C3), and both have been given by Neyman (C4).

A long paper on a similar subject has recently been published in *Biometrika* by Pepper (A27), who gives results which are almost certainly new for the means and standard deviations of certain

\* A misprint may be pointed out on p. 270 of this article (*Annals Math. Statistics*, Vol. I, No. 3, formula 23, second line for  $(3-r)^2$  read  $(3-r)^3$ ).



bivariate moments in sampling from any limited population. Pepper gives the mean values of  $p_{11}$  or  $S(x - \bar{x})(y - \bar{y})$ ,  $p_{12}$ ,  $p_{21}$ ,  $p_{22}$ ,  $p_{31}$ ,  $p_{13}$ , the standard deviation of  $p_{11}$ ,  $p_{12}$  and  $p_{21}$ , and the correlations between  $m_x$ ,  $m_y$ ,  $\sigma_x^2$ ,  $\sigma_y^2$  and  $p_{11}$ .

With the author's permission, reference may be made to a paper by Isserlis (A15), now in the press, which will be found invaluable by all who have to calculate moments of moment functions in sampling from limited populations. The paper gives a general method of procedure which will be applicable to all cases.

The principle on which this treatment is based is that the  $r$ th moment about zero of the  $s$ th moment about the mean of the sample can be expressed as the mean value of symmetric functions of the sample observations. By means of Hammond's operators, these symmetric functions may be expressed in terms of monomial symmetric functions of the sample observations. The fundamental result for our purpose is then

$$E([\dot{\alpha}_1 \dot{\alpha}_2 \dots \dot{\alpha}_j]) = e_j[\alpha_1 \alpha_2 \dots \alpha_j]$$

where

$$e_j = \frac{n!}{j!} \frac{(N \setminus j)}{(N)}$$

Here  $[\alpha_1 \alpha_2 \dots \alpha_j]$  stands for the monomial symmetric function of the observations in the universe given by

$$[\alpha_1 \alpha_2 \dots \alpha_j] = \sum x_{r_1}^{\alpha_1} x_{r_2}^{\alpha_2} \dots x_{r_j}^{\alpha_j}$$

while  $[\dot{\alpha}_1 \dot{\alpha}_2 \dots \dot{\alpha}_j]$  is the corresponding monomial symmetric function of the sample observations.

The monomial symmetric functions of the observations in the universe may be expressed in terms of the unitary symmetric functions  $[1]$ ,  $[1^2]$  . . .  $[1^r]$ . (Tables of their values have been given by MacMahon, Salmon, and Cayley, and are available up to degree 10 in Salmon's *Lessons in Modern Higher Algebra* (Cr.) These unitary symmetric functions can be expressed in terms of moments by mean of the formula

$$(-1)^\omega a_\omega = \frac{\sum p_1^{k_1} p_2^{k_2} p_3^{k_3} \dots}{k_1! k_2! k_3! \dots}$$

where

$$a_\omega = [1^\omega]$$

$$p_i = -\frac{N\mu_i}{i}$$

and

$$k_1 + 2k_2 + 3k_3 + \dots = \omega.$$

Isserlis gives tables which will be found to facilitate the various operations necessary.

A number of studies are devoted to the determination of the exact distribution of statistical estimates calculated from small samples.

Thus Pearson, Jeffery and Elderton (A26) give the frequency distribution of  $p_{11}$ , the first product moment about the sample means, for the case when the population sampled is normal.

The distribution of

$$v = \frac{np_{11}}{(1 - \rho^2)\sigma_1\sigma_2}$$

where  $\rho$ ,  $\sigma_1$ ,  $\sigma_2$  refer to the population and  $n$  is the size of sample is given by

$$y = \frac{N(1 - \rho^2)^{\frac{1}{2}(n-1)}}{\sqrt{\pi} 2^{\frac{1}{2}n-1} \Gamma\{\frac{1}{2}(n-1)\}} e^{\rho v} \{v^{1/2} K_{1/2}(v)\}.$$

The function in curled brackets is not to change sign with  $v$ , but the exponential does so.  $K_{1/2}(v)$  is the Bessel function of the second kind with imaginary argument.

Tables are provided for tracing the curve of distribution up to samples of 25, and it is further shown that good fits are obtained from samples greater than 25 by use of a Pearsonian curve with the appropriate moment coefficients.

Irwin (A14) has applied a general formula previously given by him for the frequency distribution of the mean in samples from any type of population to the case of populations of Pearson's Type I and Type VII. Baker (A2) gives a formula for the distribution of the means of samples drawn at random from a population given by the first  $(m-1)$  terms of a Gram-Charlier series, while he has also written another interesting paper (A3) on random sampling from non-homogeneous populations. He obtains expressions for

- (1) The distribution of the means of random samples of size  $n$  from a population consisting of any number of normal components.
- (2) The distribution of the standard deviations of samples of size  $n$  from a population consisting of *two* normal components.
- (3) The distribution of the means and standard deviations of samples of  $z$  from a population consisting of two different rectangular components of equal range.
- (4) The distribution of the means of samples of size  $n$  from a population consisting of *two* different components each of Pearson Type III.

Some indications are given of the nature of the distribution of the ratios of mean to standard deviation and of the higher moments about the mean of the sample.

Finally, it may be mentioned that those interested in small samples will find a useful work of reference in Rider's *Survey of the Theory of Small Samples* (A31).

It has long been known that if it is desired to fit a polynomial to a set of observations by the least square method when we do not know *a priori* what degree polynomial is appropriate, the fitting may be carried out in successive stages. First a straight line may be fitted, then an additional parabolic term, then a cubic term, and soon without it being necessary to perform the whole calculation *de novo* at each stage. The successive terms are, in fact, Tchebycheff's orthogonal polynomials. A paper by Miss F. E. Allan (A1) gives two new forms for the general expression (reached by Tchebycheff himself) for the polynomial of the *r*th degree in the case in which the observations are at equal intervals.

The history of these orthogonal polynomials is sufficiently interesting to warrant a short digression. For the case when the observations are at equal intervals they have become more widely known of recent years through the simple and elegant numerical technique of fitting introduced by R. A. Fisher (B7). The coefficients of the successive polynomials are expressed by him in terms of the successive sums of the observations, while the polynomial values of the fitted curve may be built up by successive summation from the terminal differences for which Fisher gives formulæ.

But as early as 1859 Tchebycheff himself, in addition to treating the equal interval case, showed how the polynomials can be used for fitting a curve in successive stages when the observations are not necessarily at equal intervals. A short account, in English, of Tchebycheff's work, with full references, has been given by L. Isserlis (B8), in which will be found an example of the numerical technique necessary for fitting when the observations are *not* at equal intervals. The subject has interested several mathematical statisticians, and contributions to it have been made by Gram (B1), Esscher (B2), Pearson (B5), Jordan (B4), and Khotimsky (B6).

An interesting paper "On the Mathematical Theory of Risk" has been written in English by Cramer (A8). It has two principal parts, one dealing with the individual risk theory, and the other with the collective risk theory.

In the individual risk theory we start with the individual policies and consider the frequency distribution of the gain (or loss) on each policy in a given time *t*, the gain of course depending on the time that elapses before the sum assured becomes due. These frequency distributions are usually of mixed type—that is to say, they are continuous throughout the period *t*, but have a "lump" of frequency at the end of the period, owing to the finite probability of the person assured being still alive at the end of the period. The problem is then to deduce the frequency distribution of the gain (or loss) on an aggregate of policies from the individual frequency distributions. It

has usually been considered adequate to suppose this gain normally distributed, in which case the business should be so arranged that the ratio of the mean gain to its standard deviation should be greater than 3. The author considers the relations that hold between this ratio, the loading, and the maximum sum retained by the Company on its own risk on one policy, on the assumption that the sums assured are distributed according to Pareto's Law. Such considerations would throw light on the problem of how much it is advantageous to reinsure.

He also gives a critical discussion of the hypothesis of normality by examining the error when we introduce one or more terms of his modified form of the Gram-Charlier series. He concludes that we cannot, at the present state of the theory, prove that the probability functions occurring in the theory of risk are represented by the normal function with an order of approximation which is sufficiently good to justify the applications usually made of the theory.

The collective risk theory of Lundberg, in which the company's business is conceived as being composed of a series of elementary "games," is also considered. The accumulated risk premium  $P$  is taken as the independent variable. At each moment of time the company receives the amount  $dP$  as a stake, and has the probability  $p(z)dzdP$  of being obliged to pay an amount between  $z$  and  $z + dz$ . The form of the function  $p(z)$  is considered to be invariable. "In the collective theory risk, as given by Lundberg, it is assumed that the elementary games (by Lundberg called "risk elements") are all mutually independent. The number and kind of the individual policies are left entirely out of consideration, and the accumulated risk premium  $P$ , instead of the time  $t$ , is chosen as our independent variable." On these assumptions expressions of an asymptotic character are found for the probability function of the gain and of the minimum value of the risk reserve. For details of these the reader must be referred to Cramér's paper.

In the previous *résumé* we have naturally only been able to select a few topics from the many which are being discussed in mathematical papers. We are conscious that others might have made a different selection, and mention of many other papers will be found in the accompanying bibliography. Their number points to the immense interest now being taken in statistical method, and the increasing part which it seems likely to play in both the physical and biological sciences.

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## POTATO PRICES IN ENGLAND AND WALES

1909/10-1913/14 and 1926/7-1930/1.

By R. F. GEORGE.

MUCH more work has been done in America on the analysis of agricultural produce prices than in this country, mainly because many more statistical data are available there than here. It may also be that the English statistician is inclined to investigate with a deeper caution, born of tradition, than his American colleague.

It is extremely difficult to trace the price chain of most agricultural commodities in this country on account of the imported supplies which soon mingle with the domestic product and obscure the issue under investigation. The investigator, on this line of work more perhaps than in many other directions, must constantly bear in mind the necessary condition that the prices at any two links in the marketing chain should refer to identical products. Quite clearly an invalid comparison would result from relating the British producers' prices to the retailers' prices if overseas supplies had entered the commodity flow somewhere between the first and final stages.

There are few commodities in British agriculture, therefore, for which a satisfactory price chain can be considered. Of such commodities, potatoes give as good a possibility as any, since we produce annually about 90 per cent. of our requirements. Moreover, a significant proportion of the imported supplies is represented by "new" potatoes, whereas this investigation refers wholly to the "main crop."

The data on which the following arguments are based consist of the growers' and wholesalers' returns furnished to the Ministry of Agriculture and the retail prices collected by the Ministry of Labour. The growers' prices are those received in the Wisbech area, and are believed to be fully representative of the prices received by the producers in other main potato-growing districts. The wholesalers' prices are those used for the Ministry's agricultural index number, and the retailers' prices have been taken from the official Cost-of-Living index number. From these figures a valid consideration of price and margin trends can be made. The periods considered are the five pre-war main crop potato years (September-May) beginning September 1909 and the five post-war main crop years beginning September 1926.



## A. THE TREND OF PRICES.

1. *Price received by the Grower.*

Not only within the seasons themselves, but also from year to year, post-war prices have fluctuated much more than in the earlier period, although the rise in the closing months of the 1910/11 crop year was phenomenal. The grower's average annual prices per ton were as follows :

	s.	d.		s.	d.
1909/10 . . . . .	45	1	1926/27 . . . . .	116	6
1910/11 . . . . .	64	5	1927/28 . . . . .	115	2
1911/12 . . . . .	58	7	1928/29 . . . . .	75	10
1912/13 . . . . .	66	2	1929/30 . . . . .	45	9
1913/14 . . . . .	45	7	1930/31 . . . . .	106	9
Average . . . . .	56	0	Average . . . . .	92	0

The post-war average was 64 per cent. above the corresponding pre-war figure, although the price for 1929/30 was considerably lower than the earlier average. The decline in the 1929/30 price from the level of the immediately preceding years was outstanding, and at 45s. 9d. per ton in that year the price was less than 40 per cent. of that received two years earlier. No less remarkable was the recovery in the following year, when a consistent rise took place throughout the season, and by May 1931 the grower's price was over  $4\frac{1}{2}$  times that of May 1930. In March, April, and May 1930 the grower received 33s. 6d., 33s. and 31s. 6d. per ton respectively, compared with the lowest recorded price in the five pre-war years of 36s. A year later, in May 1931, at 144s. 9d. per ton potatoes reached a price only exceeded during the period under review in April and May 1928.

2. *Price received by the Wholesaler.*

The average wholesale prices per ton for the two quinquennia were as follows :

	s.	d.		s.	d.
1909/10 . . . . .	58	2	1926/27 . . . . .	142	3
1910/11 . . . . .	74	3	1927/28 . . . . .	140	3
1911/12 . . . . .	70	1	1928/29 . . . . .	104	6
1912/13 . . . . .	86	0	1929/30 . . . . .	71	5
1913/14 . . . . .	63	8	1930/31 . . . . .	128	1
Average . . . . .	70	1	Average . . . . .	117	4

The post-war average was 67 per cent. above that of the pre-war period, compared with a corresponding increase of 64 per cent. in the grower's prices. The severe price depression of 1929/30 is evident from the above figures, when wholesale prices were almost exactly half of what they were in 1926/7 and 1927/8. The general trend of wholesale prices during recent years has been much the same as that of the grower's prices, but not so extreme. For example,

the lowest recorded post-war price was 55s. 6d. in April 1930, which, although definitely lower than the pre-war averages, was nevertheless higher than three of the monthly prices during the earlier period (September 1909, 50s. 6d.; October 1909, 47s. 6d.; September 1910, 54s.). Moreover, between 1927/8 and 1929/30 the grower's prices declined by 60 per cent.; the corresponding fall in the wholesale price was 49 per cent. The price recovery in 1930/1 characterised both series, although the relative increase over the previous year was greater in the prices received by the producer.

The following table compares the index numbers for general agricultural (wholesale) prices with that of wholesale potato prices during the last five crop years.

(1911-13 = 100.)

	General Agricultural Produce.	Potatoes.
1926/27 .. .. .	147	184
1927/28 .. .. .	144	179
1928/29 ... .. .	143	136
1929/30 ... .. .	143	93
1930/31 ... .. .	128	163
Average ... .. .	141	151

The exceptionally strong position of potato prices during 1926/7, 1927/8 and 1930/1 more than counteracted the weakness of 1929/30, and resulted in a better average over the five years considered than that for general agricultural produce. It is noticeable that the movements in the potato index were very much more violent than those for agricultural produce as a whole. The former ranged from 220 in May 1928 to 61 in April 1930, compared with the general index extremes of 155 in September 1926 and 122 in May 1931.

### 3. Price received by the Retailer.

Retail prices are only available for the post-war years, and for the quinquennium under review prices per ton were as follows :

	s.	d.
1926/27 .. .. .	205	2
1927/28 ... .. .	214	1
1928/29 ... .. .	177	9
1929/30 ... .. .	135	7
1930/31 ... .. .	185	2
Average .. .. .	183	7

In common with the grower and the wholesaler, the retailer received a rapidly falling price in 1928/9 and 1929/30, to experience a very pleasant rise in 1930/1. The 1929/30 average was nearly 37 per

cent. below that of 1927/8, compared with a corresponding fall of 49 per cent. for the wholesaler and 60 per cent. for the grower. Bearing in mind the time lag between wholesale and retail prices (probably less for potatoes than the two months suggested generally by Prof. Bowley), it is clear that the retailer is in a position of great advantage compared with either the wholesaler or the grower. This advantage is largely brought about by the inelasticity of consumer demand for potatoes, as a result of which the retailer has less reason to change his price. It may even be that in times of depression and contracted purchasing power the demand for potatoes is stimulated. In addition, the retail price is less flexible than that charged by the wholesaler. The least amount by which the recorded retail price has varied is  $\frac{1}{4}d.$  for 7 lb. or 6s. 8d. per ton, whereas price changes of 2s. 6d. or less per ton are commonly observed in the wholesale quotations. This difference in movement is illustrated in the following table :

*Number and Average Amount of Price Changes.*

	Number of			Average amount of	
	Falls.	Rises.	No change.	Falls.	Rises.
Wholesale ...	18	19	3	s. d. 5 0	s. d. 12 0
Retail ...	10	13	17	8 0	15 11

Although prices have fallen and risen on roughly the same number of occasions, it is observed that the average rise is very much greater in both price series than the average fall. (The price change between May and September has not been considered in the above table.)

That the consumer has, on the whole, received a certain advantage from the trend of retail potato prices over the last five years is evident from the following comparison of the retail food index number with that for potatoes alone :

(1924 = 100.)

	All Food.	Potatoes.
1926/27 .. ..	95	70
1927/28 ... ..	93	71
1928/29 .. ..	91	64
1929/30 .. ..	89	50
1930/31 .. ..	80	63
Average .. ..	90	64

It appears that, compared with 1924, potatoes have consistently been one of the cheaper foods, and in 1929/30 were over 40 per cent.

cheaper than food in general. Although in the following year the general food index declined considerably, while the potato index rose to a greater extent, the latter was still considerably below that of the food group.

## B. PRICE MARGINS.

### 1. *Between Grower and Wholesaler.*

The margin between the grower's and the wholesaler's prices can be considered for both the pre- and post-war quinquennia. These differences have been as follows :

			s.	d.				s.	d.
1909/10	...	...	13	1	1926/27	...	...	25	9
1910/11	...	...	9	10	1927/28	...	...	25	1
1911/12	...	...	11	6	1928/29	...	...	28	8
1912/13	...	...	18	0	1929/30	...	...	25	8
1913/14	...	...	18	1	1930/31	...	...	21	4
Average	...	...	14	1	Average	...	...	25	4

Greater fluctuations appeared in the price margin from year to year in the pre-war period than during the last five years. In the earlier period, the margin moved between 9s. 10d. and 18s. 1d., the range thus being over 53 per cent. of the average margin of 14s. 1d. During the period 1926/7-1930/1 the minimum and maximum margins were 21s. 4d. and 28s. 8d., the difference representing 29 per cent. of the quinquennial average.

The position of the grower in relation to the wholesaler can be appreciated by expressing the grower's price as a percentage of the wholesale price :

### *Percentage of the Wholesale Price received by the Grower.*

1909/10	...	...	78	1926/27	...	...	82
1910/11	...	...	87	1927/28	...	...	82
1911/12	...	...	84	1928/29	...	...	73
1912/13	...	...	79	1929/30	...	...	64
1913/14	...	...	72	1930/31	...	...	83
Average	...	...	80	Average	...	...	78

It appears that the grower has lost but little ground in the post-war years, having conceded only  $2\frac{1}{2}$  per cent. to the wholesaler. But it is apparent from the figures for 1928/9 and 1929/30 that a large part of the price decline is passed back to the grower. Whereas in 1927/8 the margin between the wholesale and grower's prices was 18 per cent. of the wholesale price, the proportion in 1929/30 had doubled. With the price recovery of 1930/1 the grower's share of the wholesale price resumed the magnitude of the years 1926/7 and 1927/8. The gross cash margin accruing to the wholesaler, as shown above, has been fairly constant in the post-war years, and it therefore seems that when the price level falls the wholesaler

increases his percentage share of the wholesale price to maintain his cash margin. The annual figures given above tend to obscure the direct reaction of changing prices on the grower-wholesaler relationship. In May 1928 and 1929, the grower received 87 and 83 per cent. respectively of the wholesale price; in May 1930 he received only 55 per cent. With the ensuing season of considerably higher prices, the grower in May 1931 again took 87 per cent.

## 2. Between Grower, Wholesaler and Retailer.

A more complete price analysis is possible for the five post-war years, since the retail prices are available for that period. The following figures show the gross cash margins between the prices paid to the grower, wholesaler and retailer for the last five main crop years :

				Amount of the Retailer's Price per ton paid to the					
				Grower.		Wholesaler.		Retailer.	
				s.	d.	s.	d.	s.	d.
1926/27	...	...	...	116	6	25	9	62	11
1927/28	...	..	...	115	2	25	1	73	10
1928/29	...	...	...	75	10	28	8	73	3
1929/30	...	...	...	45	9	25	8	64	2
1930/31	...	...	...	106	9	21	4	57	1
Average	..	..	...	92	0	25	4	66	3

These figures indicate the fluctuating prices returned to the grower, the fairly constant share paid to the wholesaler and the slowly but steadily declining margin available for the retailer. Compared with the grower, the wholesaler and retailer occupy sheltered positions, handing on to the primary producer most of the falls and, on the evidence of 1930/31, the rises in the ultimate price. In 1928/9 the retailer received 2.75*d.* per 7 lb. for distributive costs and profit; in 1930/1 he received 2.14*d.* for this purpose. The trend of the price spread as between the grower, wholesaler and retailer is shown in the following table, which gives the percentage of the retail price paid to each :

				Percentage of the Retail Price paid to the		
				Grower.	Wholesaler.	Retailer.
1926/27	...	...	...	56	13	31
1927/28	...	...	...	53	12	35
1928/29	...	...	...	43	16	41
1929/30	...	...	...	34	19	47
1930/31	...	...	...	57	12	31
Average	...	...	...	50	14	36

During the first four of the above five years the grower's share very considerably declined; the wholesaler secured a slightly increasing proportion, while the retailer's percentage increased actually by over 50 per cent. In the last year given, the relative position obtaining in 1926/7 was restored. On the average of the five years the grower has received half of the price paid by the consumer, while the retailer has secured rather more than one-third. During the last three months of the 1929/30 crop year the grower took less than one-third and the retailer exactly half of the final price.

Between 1926/7 and 1929/30 the grower's cash returns and his percentage share declined very seriously. The wholesaler during those years maintained his gross receipts by moderately increasing his proportion, whereas the retailer, although considerably increasing his proportional share, nevertheless lost ground in actual gross returns. In 1930/1 the grower's position has very considerably improved, and that of the wholesaler and retailer has become, less considerably, worse.

The story told by this brief investigation into the course of price margins suggests a very real need on the part of the grower for an organisation which will give him considerably greater protection than he already has against the adverse effects of a rapidly falling price level. Instead of being a shock absorber, he would then become a shock resister, and share equitably with his distributing partners the falls as well as the rises in the potato price level.

TABLE I.

*Average Monthly Prices received by the Grower and the Wholesaler, Sept.-May, 1909/10-1913/14 and Sept.-May, 1926/27-1930/31; and by the Retailer Sept.-May, 1926/27-1930/31. (Main crop potatoes per ton.)*

	Prices received by the				Prices received by the			Margin between	
	Grower.	Wholesale.	Margin.		Grower.	Wholesale.	Retailer.*	Grower and Wholesale.	Wholesale and Retailer.
	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.	s. d.	s. d.
1909				1926					
Sept. ...	36 0	50 6	14 6	Sept. ...	76 6	103 6	180 0	27 0	76 6
Oct. ...	40 0	47 6	7 6	Oct. ...	110 9	130 0	200 0	19 3	70 0
Nov. ...	47 6	56 6	9 0	Nov. ...	126 9	151 0	206 8	24 3	55 8
Dec. ...	50 0	61 0	11 0	Dec. ...	122 9	150 6	206 8	27 9	56 2
1910				1927					
Jan. ...	49 0	64 0	15 0	Jan. ...	123 0	149 0	206 8	26 0	57 8
Feb. ...	49 10	64 6	14 8	Feb. ...	123 0	149 6	206 8	26 6	57 2
March ...	49 4	62 0	12 8	March ...	119 9	145 0	206 8	25 3	61 8
April ...	44 8	59 6	14 10	April ...	117 6	146 0	213 4	28 6	67 4
May ...	39 2	57 6	18 4	May ...	128 9	155 6	220 0	26 9	61 6
Average ...	45 1	58 2	13 1	Average ...	116 6	142 3	205 2	25 9	62 11
Sept. ...	40 4	54 0	13 8	Sept. ...	85 0	108 0	186 8	23 0	78 8
Oct. ...	44 4	58 0	13 8	Oct. ...	95 3	123 6	193 4	28 3	69 10
Nov. ...	63 5	72 6	9 1	Nov. ...	101 0	125 0	193 4	24 0	68 4
Dec. ...	63 7	71 0	7 5	Dec. ...	106 8	125 0	200 0	18 9	75 0
1911				1928					
Jan. ...	62 8	71 6	8 10	Jan. ...	98 9	133 0	200 0	34 3	67 0
Feb. ...	57 4	71 0	13 8	Feb. ...	100 9	132 0	200 0	31 3	68 0
March ...	62 1	74 0	11 11	March ...	115 6	143 0	220 0	27 6	77 0
April ...	90 11	100 0	9 1	April ...	163 9	176 6	253 4	12 9	76 10
May ...	95 2	96 6	1 4	May ...	170 6	196 6	280 0	26 0	83 6
Average ...	64 5	74 3	9 10	Average ...	115 2	140 3	214 1	25 1	73 10
Sept. ...	63 3	71 6	8 3	Sept. ...	82 9	118 6	186 8	35 9	68 2
Oct. ...	63 0	71 6	8 6	Oct. ...	76 10	109 0	180 0	32 2	71 0
Nov. ...	56 7	68 6	11 11	Nov. ...	76 10	108 6	180 0	31 8	71 6
Dec. ...	53 9	68 0	14 3	Dec. ...	75 2	103 6	173 4	28 4	69 10
1912				1929					
Jan. ...	55 3	69 0	13 9	Jan. ...	73 9	100 0	173 4	26 3	73 4
Feb. ...	59 10	72 6	12 8	Feb. ...	73 9	99 0	180 0	25 3	81 0
March ...	59 2	71 6	12 4	March ...	78 1	110 0	180 0	31 11	70 0
April ...	59 4	74 6	15 2	April ...	73 9	103 0	180 0	31 3	75 0
May ...	57 6	64 0	6 6	May ...	71 10	87 0	166 8	15 2	79 8
Average ...	58 7	70 1	11 6	Average ...	75 10	104 6	177 9	28 8	73 3
Sept. ...	63 5	79 6	11 1	Sept. ...	57 6	83 0	160 0	25 6	77 0
Oct. ...	65 1	78 6	13 5	Oct. ...	57 6	84 6	153 4	27 0	68 10
Nov. ...	61 11	80 0	18 1	Nov. ...	57 6	83 6	146 8	26 0	63 2
Dec. ...	60 9	82 0	21 3	Dec. ...	54 3	79 0	146 8	24 9	67 8
1913				1930					
Jan. ...	67 1	86 0	18 11	Jan. ...	49 6	73 6	140 0	24 0	66 6
Feb. ...	67 4	87 0	19 8	Feb. ...	37 6	66 6	123 8	29 0	60 2
March ...	67 1	87 0	19 11	March ...	33 6	60 0	120 0	26 6	60 0
April ...	71 6	93 0	21 6	April ...	33 0	55 6	113 4	22 6	57 10
May ...	—	—	—	May ...	31 6	57 6	113 4	26 0	55 10
Average ...	66 2	84 2	18 0	Average ...	45 9	71 5	135 7	25 8	64 2
Sept. ...	47 9	67 0	19 3	Sept. ...	83 6	112 0	166 8	28 6	51 8
Oct. ...	46 2	62 0	15 10	Oct. ...	83 9	101 0	160 0	17 3	59 0
Nov. ...	45 3	60 6	15 3	Nov. ...	88 0	103 6	160 0	15 6	56 6
Dec. ...	43 4	60 0	17 8	Dec. ...	88 9	106 6	160 0	17 9	53 6
1914				1931					
Jan. ...	44 6	64 6	20 0	Jan. ...	105 6	130 6	186 8	25 0	56 2
Feb. ...	43 6	63 0	19 6	Feb. ...	111 3	133 6	186 8	22 3	53 2
March ...	40 6	62 0	21 6	March ...	111 9	133 6	193 4	21 9	59 10
April ...	54 6	70 0	15 6	April ...	143 6	166 0	226 8	22 6	60 8
May ...	—	—	—	May ...	144 9	166 0	226 8	21 3	60 8
Average ...	45 7	63 8	18 1	Average ...	106 9	128 1	185 2	21 4	57 1

\* The Retailer's price shown against any given month is that price recorded on the first day of the following month.

TABLE II.

*Index Numbers of (a) the Wholesale Price of Main Crop Potatoes and  
(b) General Agricultural Produce, Sept.-May, 1926/27-1930/31.*

(Corresponding months 1911-13 = 100.)

	1926/27.		1927/28.		1928/29.		1929/30.		1930/31.	
	Pota- toes.	General Agric. Pro- duce.	Pota- toes.	General Agric. Pro- duce.	Pota- toes.	General Agric. Pro- duce.	Pota- toes.	General Agric. Pro- duce.	Pota- toes.	General Agric. Pro- duce.
Sept. ...	140	155	146	143	160	144	112	152	151	142
Oct. ...	181	148	172	140	151	139	117	142	140	129
Nov. ...	213	148	176	137	153	141	118	144	146	129
Dec. ...	210	146	175	138	145	140	110	143	149	126
Jan. ...	195	149	174	145	131	145	96	148	171	130
Feb. ...	194	145	171	143	129	144	86	144	173	126
March ..	185	143	182	145	140	143	76	139	170	123
April ...	160	143	194	151	115	146	61	137	182	123
May ...	174	142	220	154	97	144	64	134	185	122
Average ...	184	147	179	144	136	143	93	143	163	128



TABLE III.

*The Price received by the Grower expressed as a Percentage of the Price received by the Wholesaler, Sept.-May, 1909/10-1913/14 and Sept.-May, 1926/27-1930/31.*

		Percentage of Whole- sale Price received by the Grower.			Percentage of Whole- sale Price received by the Grower.
1909	September	71	1926	September	74
	October ...	84		October ...	85
	November	84		November	84
	December	82		December	82
1910	January ...	77	1927	January ...	83
	February ...	77		February ...	82
	March ...	80		March ...	83
	April ...	75		April ...	80
	May ...	68		May ...	83
	Average ...	78		Average ...	82
	September	75	1928	September	79
1911	October ...	76		October ...	77
	November	88		November	81
	December	90		December	85
	January ...	88		January ...	74
	February ...	81		February ...	76
	March ...	84		March ...	81
	April ...	91		April ...	93
1912	May ...	99		May ...	87
	Average ...	87		Average ...	82
	September	88	1929	September	70
	October ...	88		October ...	70
	November	83		November	71
	December	79		December	73
	January ...	80		January ...	74
	February ...	83		February ...	74
	March ...	83		March ...	71
1913	April ...	80		April ...	70
	May ...	90		May ...	83
	Average ...	84		Average ...	73
	September	86	1930	September	69
	October ...	83		October ...	68
	November	77		November	69
	December	74		December	69
	January ...	78		January ...	67
	February ...	77		February ...	56
	March ...	77		March ...	56
1914	April ...	77		April ...	59
	May ...	—		May ...	55
	Average ...	79		Average ...	64
	September	71	1931	September	75
	October ...	74		October ...	83
	November	75		November	85
	December	71		December	83
	January ...	69		January ...	81
	February ...	69		February ...	83
	March ...	65		March ...	84
1914	April ...	78		April ...	86
	May ...	—		May ...	87
	Average ...	70		Average ...	83

TABLE IV.

*Index Numbers of Retail Prices of (a) All Food and (b) Potatoes.  
Sept.—May 1926/27–1930/31.*

(1924 = 100.)

	1926/27.		1927/28.		1928/29.		1929/30.		1930/31.	
	Food.	Pota- toes.	Food.	Pota- toes.	Food.	Pota- toes.	Food.	Pota- toes.	Food.	Pota- toes.
September ...	96	65	95	65	92	72	92	60	84	63
October ...	99	63	96	65	93	65	94	56	85	58
November ...	99	70	96	67	94	63	94	53	83	56
December ...	98	72	95	67	93	63	92	51	81	56
January ...	96	72	93	70	92	60	91	51	80	56
February ...	95	72	91	70	92	60	88	49	79	65
March ...	91	72	91	70	88	63	84	44	76	65
April ...	90	72	90	77	88	63	82	42	76	67
May ...	90	74	92	88	86	63	81	40	75	79
Average ...	95	70	93	71	91	64	89	50	80	63

TABLE V.

*The Share of the Retail Price, retained by the Grower, the Wholesaler and the Retailer, of Main Crop Potatoes. Sept.-May, 1926/27-1930/31.*

				Percentage of the Retail Price accruing to the		
				Grower.	Wholesaler.	Retailer.
1926	September ... ..			42	15	43
	October ... ..			55	10	35
	November ... ..			61	12	27
	December ... ..			59	14	27
1927	January ... ..			59	13	28
	February ... ..			59	13	28
	March ... ..			58	12	30
	April ... ..			55	13	32
	May ... ..			59	12	29
	Average ... ..		56		13	31
1928	September ... ..			46	12	42
	October ... ..			49	15	36
	November ... ..			52	13	35
	December ... ..			53	9	38
	January ... ..			49	17	34
	February ... ..			50	16	34
	March ... ..			53	12	35
	April ... ..			65	5	30
	May ... ..			61	9	30
	Average ... ..		53		12	35
1929	September ... ..			44	19	37
	October ... ..			43	18	39
	November ... ..			43	17	40
	December ... ..			44	16	40
	January ... ..			43	15	42
	February ... ..			41	14	45
	March ... ..			43	18	39
	April ... ..			41	17	42
	May ... ..			43	9	48
	Average ... ..		43		16	41
1930	September ... ..			36	16	48
	October ... ..			37	18	45
	November ... ..			39	18	43
	December ... ..			37	17	46
	January ... ..			35	17	48
	February ... ..			30	23	47
	March ... ..			28	22	50
	April ... ..			29	20	51
	May ... ..			28	23	49
	Average ... ..		34		19	47
1931	September ... ..			50	17	33
	October ... ..			52	11	37
	November ... ..			55	10	35
	December ... ..			56	11	33
	January ... ..			57	13	30
	February ... ..			60	12	28
	March ... ..			58	11	31
	April ... ..			63	10	27
	May ... ..			64	9	27
	Average ... ..		57		12	31

# STATISTICAL EVIDENCES OF REGRESSIVE TENDENCIES IN DISTRIBUTIVE COSTS.

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(This paper represents the substance of an Address to the Study  
Group on May 5th, 1931.)

For some years I have been engaged in a series of studies, one purpose of which is to examine statistically the behaviour in time of the expenses and profits of individual firms in trade and in banking. For this purpose I have been fortunate in having available their expenses and profits, as well as suitable amounts—net sales in the case of trading concerns and earning assets for banks—in which, for comparative purposes, they may be expressed.

These studies \* are statistical in character. It has been a guiding principle in the analyses to stay close to the original data, and so far as is possible to observe individual or group behaviour. But no one familiar with statistical analysis of economic phenomena can fail to appreciate the degree to which the results secured depend upon (1) the purpose of study, (2) the manner in which such purpose is resolved, and (3) the statistical methods and devices which are used. Accordingly, I have taken pains to be specific on these points. Moreover, I have clearly indicated the hypotheses upon which I proceeded. In the analyses of costs (expenses) in trading fields, they are as follows :

1. Expense ratios at a given time are functions of their size at a prior time.

## \* Monographs :

*Competition in the Retail Distribution of Clothing—a Study of Expense or "Supply" Curves* (Chicago, 1923).

*Expense Levels in Retailing—a Study of the "Representative Firm" and of "Bulk-Line" Costs in the Distribution of Clothing* (Chicago, 1924).

## Books :

*The Widening Retail Market and Consumers' Buying Habits* (Chicago, 1926).

*Banking Standards Under the Federal Reserve System—a Study of Norms, Trends, and Correlations of the Assets, Deposits, Expenses, and Earnings of Member Banks* (Chicago, 1928).

*Margins, Expenses and Profits in Retail Hardware Stores—Studies Determining the Relationships of Margins, Expenses, and Profits to Volume of Sales and City Size, and Measuring their Regressive Tendencies* (Chicago, 1928).

*Banking Ratios—a Study of the Operating Results of Member Banks with Special Reference to the Twelfth Federal Reserve District, and to California* (Stanford University, 1930).

2. Expense ratios of a group of firms at a given time and changes in the ratios from time to time are interrelated.
3. For a group of firms in the same field of enterprise, the nature and amount of change in the ratios from time to time are not haphazard.
4. Economic self-interest supplies a motive for keeping expense ratios as low as is possible, consistent with effective management.
5. The success of efforts to keep expenses low at a given time, or to reduce them from time to time, depends upon market conditions affecting sales and the various items of expense. The sales depend upon prices realized and quantities sold; the items of expense upon competitive and customary standards affecting primarily salaries and wages, rentals, and advertising. Price is competitive as between firms for the same article, and as between different articles in the same and in different firms. The items of expense are in part customary and in part competitive.
6. Competition, as it affects sales and expenses, is transmitted from trading area to trading area, linking up into a single market firms widely distributed, thus making their expense ratios interdependent.
7. For the entire "population" or for an adequate sample, modal or representative expense ratios tend to obtain. From time to time such ratios change slowly, and in the change regression to type takes place, this being brought about as a result of motives of economic self-interest operating in a competitive market.
8. Representative costs (expenses) and regression to type can be isolated, measured, and compared statistically.
9. Patterns of regressions for a given line of trade are largely independent of time and of the size of the sample used; for different lines of business activity they have the same characteristic features.

Some or all of the above working hypotheses have been verified in three lines of retail trade, one wholesale field, and in banking, the elapsed period of time studied being 1916 to 1925, and the data representing the end results, by years, for some thousands of individual firms.

As the studies involving the analyses referred to have proceeded, I have increasingly felt the need of constructive criticism, more especially with respect to the statistical methods employed and the practical and theoretical implications of my findings. Accordingly,

before attempting an integration and an interpretation of the studies which have been published and of those which are now in process, I have prepared, and have submitted to scholars in the United States and abroad, illustrations of my results in the field of department store trade, and a detailed statement of the statistical methods employed in reaching them.\* It is this material which has been distributed to the members and guests of the Study Group of the Royal Statistical Society. It is prepared as the basis for criticism and suggestions. In its present form it is not intended for publication. I have refrained from concluding from the several types of analyses, from attempting an integration of what is here presented, and from relating this to my other studies of the same general type.

What is desired from those present, and from others statistically minded, is criticism and suggestions concerning, among others, the following :

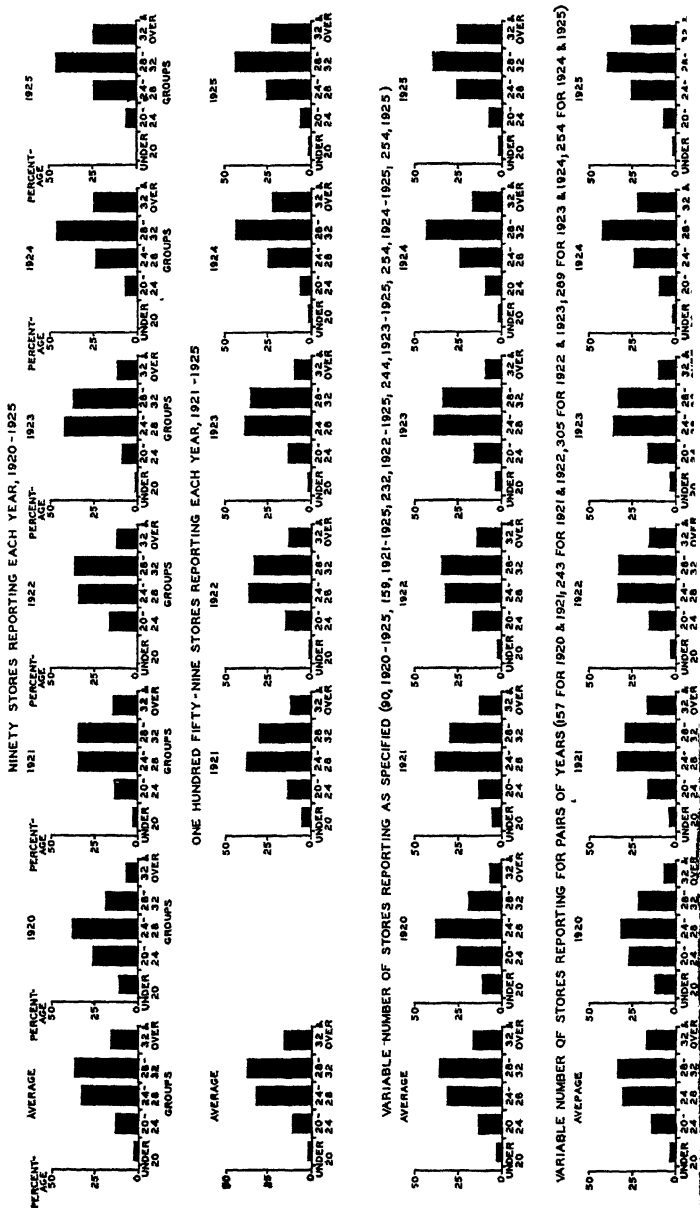
1. The statistical methods which are employed to isolate and to measure regressive tendencies.
2. The relationship between the results secured by different methods in a given field of trade.
3. Suitable measurements of the persistence through a series of years of regression to type.
4. Comparative measurements of the patterns of regression for samples of different size, and for variable periods of time and types of ratios, in a given field and in different fields.
5. The adequacy of the samples as representative of the "population," in view of the fact that while the ratios (1) are not of a random type, and exclude "births" (new firms beginning business during the period covered) and "deaths" (firms which failed during the period covered), yet at a given time they (2) give a distribution closely conforming to the normal curve of error.

It is, of course, quite impossible for me, in the short time at my disposal, to review my methods, or even more than to mention the variety of results. Let me, however, briefly describe the data used, and the characteristic features of the patterns of regression secured.

The data are yearly ratios of total operating expenses to net sales for department stores in the United States for the years 1920 to 1925. The distributions of the ratios by years for different samples are shown on Chart 1. It is seen that they are the typical bell-shape; that a type obtains year after year for a given sample, and for different samples for the same year; and that changes in time

\* Copies of this material, in limited quantities, may be secured from the author by any one who wishes it.

CHART 1.  
*Frequency Distributions of Ratios of Total Expense to Net Sales for Department Stores.*



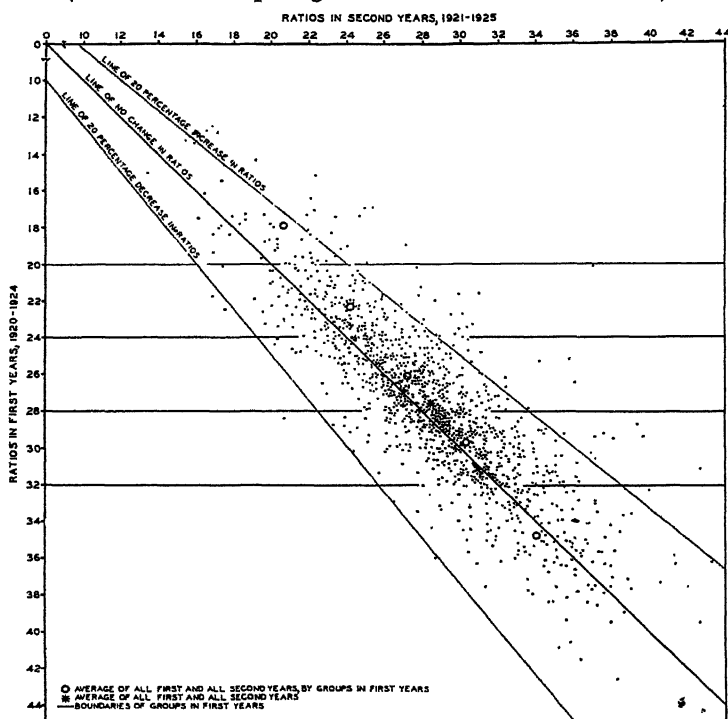
have a greater tendency to alter the form of the distributions than do changes in the size of the sample at a given time.

But the behaviour of the ratios for identical firms from year to year is not shown in Chart 1. In Chart 2 this is done for two consecutive years, account being taken of the fact and amount of change.

### CHART 2.

#### *Comparative Ratios of Total Expense to Net Sales for 1248 Department Store-Years, 1920-1925.*

(Based on Stores Reporting for at least Two Consecutive Years.)



This chart shows that ratios in second years tend to hold the same relative positions that they occupy in first years; that ratios which are relatively low in first years are higher in second years, and those which are relatively high in first years are lower in second years; and that the lower the ratios in first years the greater the amount of change between first and second years. (Observe the alignment and the scatter of the data about the "Line of no change in ratios.")

From Chart 2 there is evidence of regression to type. That is,



while ratios which are low (high) in first years tend to be low (high) in second years, those which are low (high) in first years are not so low (high) in second years, the basis for determining their relative positions being the type ratios as defined by the averages of all stores in first and in second years. (Observe the direction taken by a line connecting the averages in first and second years, according to groups in first years, relative to co-ordinates drawn through the average ratios in all first and all second years.)

It is apparent from Chart 2 that ratios in second years are positively correlated with ratios in first years. It is, of course, obvious that from such correlated variables a coefficient of regression could be determined. But such a coefficient is in the nature of an average, having both its merits and its defects. It does not, as such, disclose the peculiar behaviour in time of the details which it summarizes, and it is this which is of interest, concerned as it is with ratios of firms occupying different positions on an "expense ladder" at an instant of time. Study of the behaviour in time of ratios so placed is accordingly necessary. This has taken, among others, such forms as the following :

1. The average size of ratios in second and subsequent years, according to their size in first years, groups of equal width or of equal frequency being used in first years, and the ratios arrayed in successive years.
2. The relative number of increases or decreases in ratios between successive years, the ratios in first years being arranged in groups of equal width or of equal frequency and arrayed in successive years.
3. Comparative measures and coefficients of dispersion in second and subsequent years according to the size of the ratios in first years, groups of equal width or of equal frequency being used in first years, and the ratios arrayed in successive years.

It will suffice for our present purposes to introduce Chart 3, which illustrates one method, enumerated under (1) above. This chart has to do with ninety stores, reporting each year from 1920 to 1925. The upper part, for successive years for arrays in different years, shows the average ratios for quintal groups, identical stores by groups being included each year. The lower part gives the amount by which the yearly means for the respective groups deviate from the yearly means for all stores.

From the upper part of this chart it is seen that

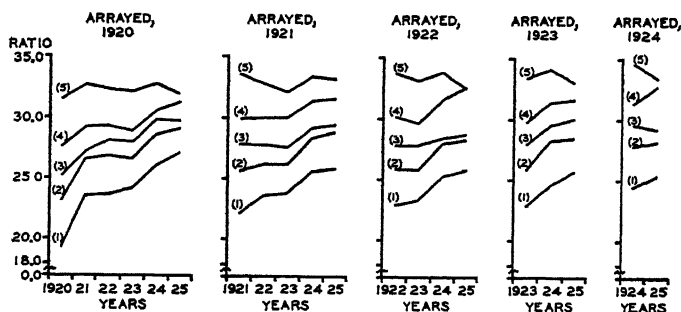
1. Average ratios which are relatively low (high) in the year of array tend in subsequent years to increase (decrease).

2. Average ratios, for groups, become successively less widely dispersed following the years of array.
3. There is a greater tendency for ratios which are relatively low, in the year of array, subsequently to increase, than there is

CHART 3.

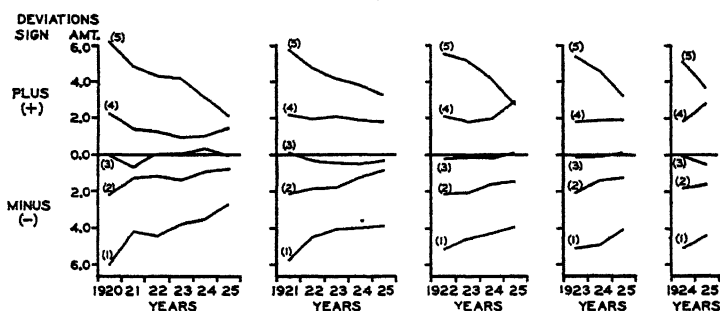
*Comparative Department-Store Average Ratios of Total Expense to Net Sales in Consecutive Years, by Ratio Groups of Equal Frequency in Different Years of Array.*

(Based upon Ninety (90) Stores Reporting Each Year, 1920-1925.)



*Amounts by which Yearly Average Department-Store Ratios of Total Expense to Net Sales, by Groups of Equal Frequency Based upon Different Arrays, Deviate Plus or Minus from the Yearly Average Ratios for all Stores.*

(Based upon Ninety (90) Stores Reporting Each Year, 1920-1925.)



(1)-(5): Successive Fifths in Order of Array.

for those which are relatively high, in the year of array, subsequently to decrease.

4. Average ratios following the years of array tend to retain the same relative positions which they occupy in the years of array.

5. The direction of change in average ratios, by groups, is generally consistent throughout the successive years following those of array.
6. The pattern of year-to-year change is largely independent of the years in which the ratios are arrayed.

From the lower part of Chart 3 it may be observed that

1. In successive years following those of array, average ratios, by groups, asymptotically approach the yearly means—they regress to type.
2. The amount of regression is a function of the size of the group averages in the year of array.
3. The regressive tendencies persist over the entire period, and tend to be independent of the year of array.

So much for evidence of regression to type as shown by the averages for groups of equal *frequency*. But the same phenomenon holds for ratios classified into groups of equal *width*. Moreover, the greater the length of time between the year of array and a given year, the smaller the differences between the group averages and the average of the total "population." That is, the means of the groups approach in time the mean of the total "population."

The time at my disposal does not permit me to describe the regressive tendencies of expense ratios in the retail distribution of dry goods as shown by (1) the proportion of the year-to-year changes—increases or decreases—at different expense levels, and (2) the behaviour of comparative average and standard deviations from year to year for ratios by groups independently and in relation to the corresponding summaries of the "population." Suffice it to say that for this, as for other bodies of data studied, a regressive tendency is everywhere encountered. The forms which it takes with different methods of isolation are consistent for a given body of material, and are much the same, with a given form of analysis, in retailing, wholesaling, and banking. Moreover, regression characterizes not only operating expenses, but also gross and net trading profits. Then, too, it tends to be independent of the size of the sample used, and of the period of years covered. It appears to be a general phenomenon.

The problems upon which I desire your critical judgment and that of others who are statistically minded relate to (1) the statistical technique of measurement in a given field, and (2) comparative measurements in different fields. Concerning the practical and theoretical implications of the phenomenon I am interviewing others.

It is a pleasure to have had the opportunity of presenting my problems to the Study Group, and I thank you for your consideration in listening to me.

## REPORT OF THE COUNCIL

*For the FINANCIAL YEAR ended December 31, 1930, and for the SESSIONAL YEAR ending June 16, 1931, presented at the NINETY-SEVENTH ANNUAL GENERAL MEETING of the ROYAL STATISTICAL SOCIETY, held in the Hall of the Royal Society of Arts, John Street, Adelphi, W.C. 2, on June 16, 1931.*

THE Council have the honour to submit their Ninety-seventh Annual Report.

The roll of Fellows on December 31 last, as compared with the average of the previous ten years, was as follows :—

Particulars.	1930.	Average of the previous Ten Years.
Number of Fellows on December 31 ... ..	1,058	1,028
Life Fellows included in the above ... ..	204	196
Number lost by death, withdrawal, or default ... ..	68	53
New Fellows elected ... ..	50	70

Since December 31st last, 35 new Fellows have been elected or restored to the list, and the Society has lost 45 by death, resignation, or default, so that the number on the list, excluding Honorary Fellows, on June 16, 1931, is now 1048.

Since June, 1930, the Society has lost by death the under-mentioned Fellows :—

					Date of Election.
	*Brotherton of Wakefield, Rt. Hon. Lord	...	...	...	1919
<i>d p</i>	De Jastrzebski, T. T. S.	...	...	...	1914
<i>d</i>	Garcke, Emile	...	...	...	1887
	*Hammersley, H. G.	...	...	...	1884
	Jagger, Hon. John W.	...	...	...	1902
	Janisch, Noel, C.M.G.	...	...	...	1908
	Jones, David T.	...	...	...	1914
	*Le Roy-Lewis, Col. Herman, C.B., D.S.O.	...	...	...	1887
	Melchett, Rt. Hon. Lord	...	...	...	1911
<i>d p</i>	†Soper, Herbert Edward, M.A.	...	...	...	1914
<i>d</i>	Temperley, William A.	...	...	...	1888

*d* Donor to the Library.

*p* Contributor to Proceedings.

\* Life Fellow.

† Guy Medallist.

## Representatives of Corporate Bodies :

Foster, A. W., B.A., representing The Paper-makers' Association of Great Britain and Ireland	... ..	1922
Greenhough, William H., representing The Reading Libraries	... ..	1929
Hooper, John, B.A., representing The Statistical and Social Inquiry Society of Ireland	... ..	1925
Perrin, William Gordon, representing The Board of Admiralty	... ..	1920
Whiteley, F. Ogden, O.B.E., representing The Institute of Municipal Treasurers and Accountants	... ..	1920

Not only this Society but also the scientific world which concerns itself with statistics suffered a grievous loss by the death of Mr. H. E. Soper in July, 1930. He had been a Fellow of the Society for sixteen years, and the Council passed the following resolution and ordered it to be conveyed to his sister, Miss Mary Soper :—

“The Council of the Royal Statistical Society record with profound regret the loss statistical science has sustained through the death of Mr. Herbert Edward Soper, whose contributions to the theory of statistics have been recognized by men of science throughout the world to be of first-rate importance. They request that the President will convey to Mr. Soper's family this expression of their sympathy and of their sense of Mr. Soper's services to learning.”

The Guy Medal (in silver) of the Society, which was awarded to Mr. Soper last year shortly before his death, was presented to Miss Mary Soper at the November meeting. An appreciation, by Professor Greenwood, of his original work in statistics and of the no less original modesty which was apt to be an obstacle to the general recognition of his merits, appeared in the first part of the *Journal* for this year.

The same issue contains an obituary notice of Mr. John Hooper, the Director of the Statistical Office of the Irish Free State and the ex-President of the Statistical and Social Inquiry Society of Ireland, who died last autumn. Although Mr. Hooper only joined the Royal Statistical Society in 1925, as representative of the sister Society above mentioned, his official statistical work, which began before the constitution of the Irish Free State, had brought him into touch with our Society and with many of its Fellows, and his loss is sincerely regretted.

The loss of Mr. T. T. S. de Jastrzebski is also recorded with much regret. He joined the Society in 1914, soon after he was transferred from the Records branch to the Statistical Department of the General Register Office, from which he retired in 1924, after

holding for some years the office of Assistant-Registrar-General. Mr. de Jastrzebski took a great interest in the work of this Society and contributed two papers to its Proceedings, one of which, "The Register of Belgian Refugees," was read and discussed at a meeting (1916). A note on Mr. de Jastrzebski's career, which included forty-three years of Government service, was printed in Part IV of the *Journal* for 1930.

Since June, 1930, the following new Fellows have been elected:—

Agrawal, Prof. Shankar Lal, M.A., B.Sc.	Lyon, Stanley G.
Beaton, Donald.	MacCallum, Arthur.
Bilbrough, Norman Heslop.	McLellan, Marjory Hope.
Borthwick, the Hon. William.	Marvin, Donald Mitchell.
Carey, William Harry Brenton.	Mehrbhan, Nowsherwan Asbandiar.
Clark, Colin Grant, B.A.	Morrell, Clayton Conyers, M.D., D.P.H.
Clark, Stanley.	Nathan, Harry Louis, M.P.
Daniels, Prof. George W.	Palmer, William Jocelyn Lewis.
Escott, William Henry.	Paterson, James Newton.
Fieller, Edgar Charles.	Perkins, Ernest Benson.
Glesinger, Dr. Egon.	Potter, Sydney Barnett Mackenzie.
Graham, Harold, A.S.A.A.	Potts, Thomas Austin.
Hansen, Sidney P.	Raja, Kizakke Covilagam Kuttyettan.
Healey, Frank.	Robinson, Charles Alan.
Hill, William Edward.	Russell, William Thomas.
Holmes, Richard Lewis Anthony.	Shaul, John R. E.
Hore-Belisha, Leslie, M.P.	Shirname, Takaram Gopal.
Hughes, Horace Francis.	Simmons, J. R. Mainwaring.
Humphreys, John Foster, A.I.S.A.	Simon, Moolavil Joab, B.A.
Jewkes, John.	Simpson, John William.
Karsondas, Chunilal.	Sprague, Prof. O. M. W.
Khandelwal, Hari Prasad.	Srivasachari, W. N.
Kheshvala, Keki Merwanji.	Stephen, Percy William.
Kirkham, George Penn Titterton.	Taylor, Leonard Albany, A.C.I.S.
Knight, Harold Victor.	Thomas, John Herbert.
Landless, Edwin Kay.	Tyson, Charles H., B.Sc.
Lane, Ben Sidney.	Wicks, Henry William.
Lewis, Harold George.	

#### Representatives of Corporate Bodies :—

Bradley, Harry	<i>representing</i> The British Boot Shoe and Allied Trades Research Association.
Eason, J. C. M.	<i>representing</i> The Statistical and Social Inquiry Society of Ireland.

During the Session 1930–31, 57 new Fellows were elected (one in place of a former corporate representative), and the total number of Ordinary Fellows is now 1048.

Statements showing the Society's receipts and expenditure during 1930 and the financial position at the end of that year are given,

as heretofore, in appendices. The Council has for some time felt that the form of the Society's accounts was in need of revision, and during the past Session appointed a Committee under the Chairmanship of Dr. David Heron to consider the matter. The Committee gave much time and care to the work and proposed a new form of accounts which was accepted by the Council. The statements annexed are drawn up in the new form, the principal modifications being the substitution (in A. ii) of a balance sheet for the former statement of assets and liabilities, a rearrangement and simplification of the items of receipts and expenditure (A. i), and fuller information in the comparative statement of the condition of the Society (B. i). The other tables previously published have now been omitted, the essential part of the information they contained being obtainable from the main statements. In adopting the revised form of accounts the Council at their May meeting passed a cordial vote of thanks to the Committee, and in particular to Dr. Heron. The enquiries carried out by the Committee imposed a considerable amount of additional work on the staff of the Society, and the Council also expressed their appreciation of their work.

The Ordinary Meetings have been held in each month of the Session, and the papers read before the Society were as follows:—

## 1930.

- |                 |     |   |
|-----------------|-----|---|
| I.—November 18  | ... | STAMP, SIR J. C., G.B.E., LL.D. The National Capital. (Presidential Address.)                 |
| II.—December 16 | ... | GORDON, A. P. L. Statistics of Totalisator Betting.   |
| III.—January 20 | ... | BRACE, JAMES, LL.B., B.Sc. A Statistical Analysis of Building Societies.                      |
| IV.—February 17 | ... | JONES, D. CARADOG, M.A. Social Survey of Mersey-side: Poverty, Overcrowding, Social Services. |
| V.—March 17     | ... | Discussion on the Forthcoming Census. Opened by S. P. VIVIAN, the Registrar-General.          |
| VI.—April 21    | ... | SNOW, E. C., D.Sc. Relative Importance of Export Trade.                                       |
| VII.—May 19     | ... | RHODES, E. C., D.Sc. Labour and Output in the Coal-mining Industry.                           |
| VIII.—June 16   | ... | SPRAGUE, Prof. O. M. W. Major and Minor Trade Fluctuations.                                   |

The Study Group, under the chairmanship of Mr. A. P. L. Gordon, has held nine meetings during the session, and the subjects and openers of the discussions were as follows:—

- |          |     |   |
|----------|-----|---|
| October  | ... | Statistics in Relation to Advertising.—THE CHAIRMAN.  |
| November | ... | New Work on Wholesale and Retail Prices.—C. G. CLARK. |
| December | ... | The Future of the Rate of Interest.—A. M. SOUTHALL.   |

January	...	A Census of Distribution.—IRIS DOUGLAS, M.A.
February	...	Statistics of Foreign Trade.—H. C. CRAFT.
March	...	Is the Universe Statistical?—J. O. IRWIN, D.Sc., M.A.
April	...	Snapshots of Buying Potentiality.—DUDLEY W. WALTON.
May	...	Business Expense Ratios.—PROF. H. SECRIST.
June	...	Report of the Price Investigation Committee.

At the November meeting a small Committee was elected to investigate such movements in prices as it considered desirable. This Committee has dealt chiefly with certain aspects of the cost of various services and reported progress in June. The December meeting was held jointly with the Institute of Actuaries Students' Society, under the Chairmanship of Mr. Trouncer, President of the Institute of Actuaries. A very large number attended at Staple Inn Hall and Mr. Southall's address was warmly received. In May the Group welcomed Professor Secrist of the North Western University, Chicago, and was honoured by the presence among the audience of prominent Fellows of the parent Society.

For the Session, 1931–32, Mr. A. P. L. Gordon has been elected Chairman and Mr. R. F. George Secretary of the Group.

At the request of the Registrar-General the Council appointed a special Committee, as had been the practice in the past, to consider recommendations with respect to this year's Census. The Committee's report was adopted by the Council at their meeting last July, and was forwarded to the Registrar-General. The Report was printed in Part IV of the *Journal* for 1930, and was discussed at the Society's meeting on March 17.

The Council intend to offer the Frances Wood Memorial Prize for competition in 1932. It was last offered in 1930, but no essay was judged to be of a sufficiently high standard of merit to receive an award.

Mr. Udny Yule, F.R.S., is retiring next September from the post of Reader in Statistics in the University of Cambridge, which he has held with so much distinction since 1912, and it is announced that his place is to be filled by Dr. John Wishart, who is at present assisting Dr. R. A. Fisher at the Rothamsted Experimental Station. Dr. Wishart joined the Society in 1929, and has taken a prominent part in the work of the Study Group, which, to the regret of his colleagues, he will not be able to continue. Two other appointments at Cambridge have fallen to Fellows of the Society, Mr. John Hilton, an Assistant Secretary to the Ministry of Labour, having been elected Montague Burton Professor of Industrial Relations,



while Mr. Colin Clark, a member of the Study Group, has been appointed to a lectureship in statistics in the Faculty of Economics.

In the year ended May 31, 1931, 1335 works were added to the Library compared with 1222 in the previous year. These figures are exclusive of periodicals and of a number of minor Parliamentary Papers. During the same period 1609 volumes were borrowed by 749 Fellows, against 2300 by 836 Fellows the year before.

The Fellows named below (nominated in accordance with By-law 14) are recommended for election as President, Council and Officers of the Society for the Session 1931–32 :—

*President.*

Sir Josiah Charles Stamp, G.B.E., LL.D., D.Sc., F.B.A.

*Council.*

*W. A. Basham, O.B.E.	A. Bradford Hill, D.Sc.
*Sir W. H. Beveridge, K.C.B.	Alfred Hoare.
M. S. Brkett, O.B.E.	Robert Holland-Martin, C.B.
Sir Basil Blackett, K.C.B., K.C.S.I.	Professor J. H. Jones.
James Bonar, LL.D.	A. W. Waterlow King.
Professor A. L. Bowley, Sc.D., F.B.A.	H. W. Macrosty, O.B.E.
A. R. Burnett-Hurst.	E. C. Rhodes, D.Sc.
Henry Clay.	E. C. Snow, D.Sc.
*Clara E. Collet.	J. Calvert Spensley, O.B.E.
Lewis R. Connor.	*J. W. Verdier, O.B.E.
W. Palin Elderton, C.B.E., F.I.A.	*Harold Vigor.
Dorothy P. Etlinger.	S. P. Vivian, C.B.
Professor Major Greenwood, F.R.S.	Sir A. W. Watson, K.C.B., F.I.A.
A. P. L. Gordon.	A. D. Webb.
Sir W. H. Hamer, M.D., F.R.C.P.	*John Wishart, D.Sc.

Those marked \* are proposed as new Members of Council.

*Honorary Treasurer.*

Robert Holland-Martin, C.B.

*Honorary Secretaries.*

M. Greenwood, F.R.S.                      H. W. Macrosty, O.B.E.  
E. C. Snow, D.Sc.

*Honorary Foreign Secretary.*

M. Greenwood, F.R.S.

The abstract of the Treasurer's account of receipts and payments and the balance sheet as on December 31, 1930, together with

the report of the Auditors on the accounts for the year 1930 are appended.

Signed on behalf of the Council,

J. C. STAMP,

*President.*

M. GREENWOOD,	}	<i>Hon Secretaries.</i>
H. W. MACROSTY,		
E. C. SNOW.		

## APPEN

## A.—(i) RECEIPTS AND PAYMENTS ACCOUNT FOR

<i>Year 1929.</i>		<b>RECEIPTS.</b>				<i>Year 1930.</i>	
£	s. d.					£	s. d.
		Annual subscriptions :—					
1,585	10 0	For current year (713)	...	...		1,497	6 0
161	14 0	Arrears (53)	...	...		111	6 0
56	14 0	In advance (26)	...	...		54	12 0
1,803	18 0					1,663	4 0
		Dividends and interest (including in-					
400	8 3	come tax refunded)	...	...		451	2 9
866	9 3	Journal sales (including reprints)	...	...		1,026	0 3
9	0 0	Journal advertisements	...	...		7	10 0
52	15 4	Sales of other publications	...	...		5	5 4
60	10 6	Use of rooms	...	...		60	10 6
1	5 8	Miscellaneous	...	...		6	16 0
3,194	7 0	Total of Ordinary Receipts	...	...		3,220	8 10
—		Sale of set of "The Times"	...	...		600	0 0
136	10 0	Life compositions	...	...		126	0 0
£3,330	17 0					£3,946	8 10

## DICES

THE YEAR ENDED 31st DECEMBER, 1930.

Year 1929.			PAYMENTS.	Year 1930.		
£	s.	d.		£	s.	d.
			Journal :—			
646	12	5	Printing and paper ... ..	643	9	0
39	0	0	Reviewing ... ..	45	3	0
23	12	0	Reporting ... ..	22	0	6
84	7	0	Distribution ... ..	96	16	11
44	19	9	Re-purchase of scarce parts ...	33	11	6
<hr/>				<hr/>		
838	11	2		841	0	11
			Meetings (including printing and post- age) ... ..	151	4	4
149	15	6	Library books ... ..	58	1	4
61	7	4	Library binding ... ..	62	3	6
94	5	8	Salaries and wages ... ..	863	18	2
877	18	3	Rent ... ..	380	0	0
380	0	0	Land tax ... ..	2	15	5
2	15	5	Insurance ... ..	14	8	10
14	2	6	Fuel, light and water ... ..	84	2	5
82	5	0	House expenses ... ..	40	10	6
24	3	2	Repairs to premises ... ..	27	0	6
13	5	1	Furniture and equipment ... ..	27	14	0
—			Postage, carriage and telephone ...	59	9	7
63	7	5	Stationery and miscellaneous printing	117	13	8
121	4	9	Guy Medals ... ..	25	5	0
—			Miscellaneous ... ..	8	2	9
17	15	5		<hr/>		
2,740	16	8	Total of Ordinary Payments ... ..	2,763	10	11
			Investments purchased (£875 3½% Conversion Loan) ... ..	699	11	0
504	15	9		<hr/>		
3,245	12	5		3,463	1	11
85	4	7	Excess of Receipts over Payments ...	483	6	11
<hr/>				<hr/>		
£3,330	17	0		£3,946	8	10
<hr/>				<hr/>		

## APPEN

## A.—(ii) BALANCE SHEET

			<b>LIABILITIES.</b>					
<i>Year 1929.</i>						<i>Year 1930.</i>		
£	s.	d.				£	s.	d.
56	14	0	Advance annual subscriptions	...	...	54	12	0
48	5	0	Advance Journal subscriptions	...	...	104	9	0
223	3	11	Sundry creditors	...	...	202	4	6
<hr/>						<hr/>		
328	2	11	Life composition fund	...	...	61	5	6
1,291	10	0	Balance in favour of the Society (exclusive of (1) Books in Library, (2) Journals and other publications in stock, and (3) Pictures, Furniture and Fixtures)	...	...	1,417	10	0
7,303	12	4				8,331	17	7
<hr/>						<hr/>		
£8,923	5	3				£10,110	13	1

## BUILDING FUND (ESTAB

On 31st December, 1929, the Fund consisted of £619 6s. 3½ per cent. Con 1930 (£34 18s. 10d.) were invested in £21 17s. 1d. 3½ per cent. Conversion £641 3s. 1d. 3½ per cent. Conversion Loan, and £577 18s. 3d. 4 per cent. being £1,048.

## FRANCES WOOD MEMORIAL FUND

On 31st December, 1929, the Fund consisted of £500 4 per cent. Preference During 1930, dividends of £15 15s. were received and £12 of Income Tax December 31, 1930, the Fund consisted of £500 4 per cent. Preference at 61, £305, and £77 13s. 6d. cash in hand.

## REPORT OF

“We have examined the foregoing Receipts and Payments Account, Balance Memorial Fund with the Books and Vouchers of the Society and find them opinion, properly drawn up so as to exhibit a true and correct view of the Investments and Cash Balances.”

## DICES

AT 31st DECEMBER, 1930.

		ASSETS.			
Year 1929.				Year 1930.	
£	s. d.			£	s. d.
		Investments at cost or under :—			
		£2,236 11s. 3d. 2½% Consols (General			
1,185	0 0	Fund) ... ..		1,185	0 0
		£10,527 12s. 3d. 2½% Consols (Guy			
5,580	0 0	Bequest) ... ..		5,580	0 0
600	0 0	£1,841 31% Conversion Loan. ...		1,299	0 0
504	0 0	£500 5% War Loan 1929–47 ...		504	0 0
		£666 4% 2nd Pref. Stock, L. & N.E.			
386	0 0	Rly. ... ..		386	0 0
		£266 5% Prefd. Ord. Stock, L. &			
101	0 0	N.E. Rly. ... ..		101	0 0
		(Market value, £9,636.)			
8,356	0 0	Cash :—		9,055	0 0
		On deposit ... .. £ s. d.			
300	0 0	On current account 438 0 1			
158	15 2	In hand ... .. 9 18 10			
5	16 10			947	18 11
464	12 0	Arrears of annual subscriptions re-			
		coverable (say 40) ... ..		84	0 0
84	0 0	Sundry debtors ... ..		23	14 2
48	13 3				
£8,923	5 3			£10,110	13 1

LISHED 10TH JULY, 1873).

version Loan, and £557 6s. 4 per cent. Consols. The dividends received during Loan, and £20 12s. 3d. 4 per cent. Consols, and the Fund now consists of Consols, the total value at 31st December, 1930 (at 81 and 91½ respectively)

(ESTABLISHED 13TH MAY, 1920).

Stock, London, Midland & Scottish Railway, and £49 18s. 6d. cash in hand. was refunded. No payments were made out of the Fund in 1930, and at Stock, London, Midland & Scottish Railway (value at 31st December, 1930,

## THE AUDITORS.

Sheet and Statements in regard to the Building Fund and the Frances Wood to be in accordance therewith. We report that the Balance Sheet is, in our state of the Society's affairs, as shown by the Books. We have verified the

(SIGNED) P. G. BROWN.  
J. CALVERT SPENSLEY.  
J. W. VERDIER.

## APPEN

## B.—STATEMENT OF THE CONDITION OF THE SOCIETY

Year.	Constitution.				Fin					
	Number of Fellows at end of Year.		Changes during the Year.		Receipts.					
	Totals.	Life Fellows included therein.	Gains by Election, &c.	Losses by Death, &c.	Annual Subscrip- tions	Com- posi- tions. <sup>1</sup>	Divi- dends, Interest, &c. <sup>2</sup>	Journal Sales	Other Items.	Totals.
1906	891	177	43	63	£ 1,464	£ 82	£ 333	£ 225	£ 170	£ 2,274
1907	861	172	33	63	1,363	82	349	327	58	2,179
1908	855	170	40	46	1,339	84	351	254	143	2,171
1909	825	167	52	82	1,307	84	354	273	42	2,060
1910	845	172	57	37	1,304	141	420	326	54	2,245
1911	867	174	62	40	1,415	126	341	308	65	2,255
1912	854	175	44	57	1,336	105	341	334	41	2,157
1913	846	174	53	61	1,331	84	341	294	58	2,108
1914	821	169	39	64	1,281	42	339	271	51	1,984
1915	772	163	12	61	1,243	63	319	268	32	1,925
1916	758	163	34	48	1,181	42	284	325	18	1,850
1917	757	161	40	41	1,186	53	276	311	130	1,956
1918	761	167	47	43	1,132	222	456	305	3	2,119
1919	796	172	91	56	1,297	273	276	603	10	2,459
1920	882	180	123	37	1,373	251	291	730	95	2,740
1921	946	186	112	48	1,481	231	603	662	39	3,015
1922	969	187	71	48	1,499	126	454	689	142	2,910
1923	996	195	66	39	1,476	242	506	739	114	3,075
1924	1,002	194	68	62	1,638	105	400	666	81	2,890
1925	1,030	195	79	51	1,611	189	399	807	43	3,049
1926	1,054	197	77	53	1,619	116	404	780	112	3,031
1927	1,074	199	62	42	1,665	84	376	792	84	3,001
1928	1,079	201	56	51	1,680	84	397	748	87	2,996
1929	1,076	202	61	64	1,804	137	400	866	124	3,331
1930	1,058	204	50	68	1,663	126	451	1,026	680 <sup>3</sup>	3,946

<sup>1</sup> Carried to Life Composition Fund from 1921 onwards.<sup>2</sup> Including income tax refunded.<sup>3</sup> Exclusive of the Building and Frances Wood Memorial Funds.

## DICES

## DURING THE LAST TWENTY-FIVE YEARS, 1906-1930.

Payments.							Market Values of Investments at end of Year. <sup>3</sup>	Year.
Journal.	Meet-ings.	Library, Books and Binding.	Salaries and Wages.	Rent.	Other Items.	Totals.		
£	£	£	£	£	£	£	£	
681	86	95	554	380	193	1,989	11,449	1906
571	69	87	530	380	176	1,813	11,746	1907
535	72	93	602	380	458	2,140	11,920	1908
636	74	99	550	380	315	2,054	12,085	1909
808	90	74	582	380	727 <sup>4</sup>	2,661	11,210	1910
621	89	104	602	380	576	2,372	10,874	1911
725	85	81	620	380	283	2,174	10,599	1912
658	76	79	632	380	233	2,058	10,092	1913
793	82	88	615	380	361	2,319	9,528	1914
458	64	40	480	380	222	1,644	8,182	1915
516	50	36	492	380	181	1,655	7,702	1916
413	71	54	516	380	199	1,633	7,656	1917
651	91	33	534	380	211	1,900	8,282	1918
774	86	50	645	380	349	2,284	7,672	1919
913	89	99	904	380	454	2,839	6,848	1920
900	110	94	954	380	390	2,828	7,605	1921
983	98	103	1,006	380	755 <sup>5</sup>	3,325	8,605	1922
922	146	107	1,010	380	445	2,940	8,666	1923
947	127	138	1,022	380	357	2,971	8,962	1924
940	132	116	1,021	380	373	2,962	8,423	1925
1,144	131	98	991	380	366	3,110	8,122	1926
1,213	150	119	899	380	302	3,063	8,375	1927
835	136	104	793	380	517	2,765	8,343	1928
839	150	156	878	380	238	2,741	8,462	1929
841	151	120	864	380	408	2,764	9,636	1930

<sup>4</sup> Includes £436 for re-decoration, etc., in 1910.<sup>5</sup> Includes £395 for Catalogue printing in 1922.<sup>6</sup> Includes £600 from sale of *Times* in 1930.



PROCEEDINGS OF THE NINETY-SEVENTH ANNUAL GENERAL MEETING  
OF THE ROYAL STATISTICAL SOCIETY, HELD IN THE HALL OF  
THE ROYAL SOCIETY OF ARTS ON TUESDAY, JUNE 16, 1931.

The Chair was taken by the President, Sir J. C. STAMP, G.B.E., LL.D., D.Sc., at 5.0 p.m.

The HONORARY SECRETARY read the circular convening the meeting.

The CHAIRMAN, in presenting the Report of the Council, which had previously been distributed to the Fellows present, and according to custom, was taken as read, said that there were one or two items in it to which he would like to draw attention.

On pages 601 and 602 reference was made to the revised form of the Society's accounts, which was the result of very careful investigation by a special Committee under the chairmanship of Dr. David Heron. The accounts were now presented in a better form, and some of the statistical tables had been greatly improved. He hoped some of the Fellows would give attention to the changes made, and would recognise that this Committee had done some useful work.

Referring to the activities of the Study Group, Sir Josiah Stamp said that this was a new venture which was not only excellent in itself, but was also a very fine movement for the ultimate strength of the parent Society, as it was from these younger members that it was hoped to draw the strength of the Society in years to come. There was no intention of making the Study Group a rival, but it was a very important feeding-ground for statistical workers, and he hoped that all who were in a position to encourage the work of that group would do so.

He also wished to draw attention to the fact, referred to in the Report, that Mr. Udny Yule was retiring next summer from the post of Reader in Statistics in the University of Cambridge, a position he had held since 1912. The particular point was that in connection with that retirement Mr. Yule had been going over his Library, and had made a very generous gift of books to the Society. He felt sure it would be the wish of the Society that he should express thanks to Mr. Yule for thinking of the Library in this extremely practical way.

The CHAIRMAN now called upon the Honorary Secretary to present the list of defaulters who had to be struck off the Roll, owing to their subscriptions being more than two years in arrear.

The HONORARY SECRETARY read the list of defaulters, as follows :—

A. Bellingham, W. P. Brattle, A. C. Hutchins, A. M. Jones, N. J. Shah, B. W. Sparrow, F. S. Sparrow, C. R. Taylor, F. H. Taylor, C. F. T. Walker, V. P. Ward, R. J. Winters.

Sir JOSIAH STAMP moved that the Report of the Society be adopted, entered in the Minutes, and printed in the *Journal*.

Mr. R. A. ABABRELTON seconded the resolution, and in doing so said he was glad the membership was increasing. He had tried to get some members from South Africa, as he did not think that country was sufficiently represented in the membership. As the President of the South African Statistical Society would be over in England for the British Association meeting, he hoped it would be possible to obtain some of his members as Fellows of the Royal Statistical Society.

Sir JOSIAH STAMP put the adoption of the Report to the meeting, and it was carried unanimously.

It was announced that the ballot for the President, Council and Officers for the coming Session would be taken during the Meeting, Mr. R. F. George and Mr. G. R. White being appointed as scrutineers.

Mr. TRACHTENBERG said it gave him great pleasure to propose a vote of thanks to the President, Officers, and Council of the Society. He had all the more pleasure in proposing this vote because there had been times in his life, beneath the semi-tropical sun of Jerusalem, when he had treated the arrival of the *Journal* as a connecting link with the activities at home. He appreciated the smooth working of the Society owing to the activities of the Council, and it gave him very great pleasure to propose this vote of thanks.

Mr. SOUTHALL seconded the motion, which was put to the meeting, and carried unanimously.

The CHAIRMAN said he felt sure he was speaking in the names of the Council and Officers when he thanked the Fellows present for the vote of thanks that had just been accorded. The work of the Society had always been pleasant, but never more than in the past twelve months. He was glad the conduct of affairs had met with satisfaction; there had been some important work to do, and although there might not have been anything specially to mark out this past year, it had added something to the usefulness of the Society.

The Meeting then adjourned for the Ordinary Meeting.

## REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Smoothing of Time Series*. By Frederick G. Macaulay. 9" x 6". 172 pp. New York: National Bureau of Economic Research. 1931. \$2.

Statisticians usually smooth historical series by means of simple fitted curves or moving averages, and the alternative of *Graduation*, in the sense understood by actuaries, has not received the attention it deserves. The reasons for neglect are threefold: historical data are scanty, vague and inaccurate; they never reach finality; and their movements are of a different kind from those shown by static phenomena, so that it is at once more difficult and less worth while to apply the refinements involved in actuarial methods.

The present work grew out of an investigation into the history of interest rates and security prices in the United States since 1857, in which graduation methods were used with success—a success that may well lead to their wider adoption by economic statisticians.

First as to the nature of the problem. "Any graduation of economic time series," says Dr. Macaulay, "must almost inevitably be for a particular purpose only. The graduations . . . are not intended to replace the data. In this they differ from the adjustments made on physical observations in order to eliminate errors of measurement. They also differ from graduations which are intended to estimate the 'universe' from a sample. The graduation of a mortality table is of this type." Much work on historical series has been obscured by neglect of these fundamental distinctions,

and it is satisfactory to have Dr. Macaulay's authoritative opinion upon record.

The author's remarks on the characteristics of time series are interesting, in view of the recent work of Mr. Udny Yule in the same field. "Many economic time series seem to be of a type somewhat analogous to cumulated chance series. Some economic series suggest chance series which have been cumulated twice. . . . The commonest type of economic time series suggests a cumulated chance series on which has been superposed another but non-cumulated chance series and a more or less regular and unchanging seasonal fluctuation."

The main body of the work is devoted to a detailed examination of various possible graduation formulæ, in the course of which the following matters are discussed: simple moving averages, mid ordinates of third degree parabolas fitted by least squares, third degree parabolic graduation formulæ having smooth weight diagrams, summation formulæ, fifth degree parabolic formulæ, Dr. Rhodes's method and the Whittaker-Henderson method. A useful feature consists in three pages of graduation weight diagrams, which give a clear idea of the structure of the various formulæ from the weighting standpoint. It is unfortunate, however, that this section utilizes a purely verbal exposition and that no proofs are given. Lack of symbolism makes the reading very hard to follow.

As a result of this discussion, preference is given to two methods, viz. a 43-term seasonal eliminating formula based upon summation principles and the Whittaker-Henderson method, which depends upon the fact established by Professor Whittaker, that if data be smoothed in such a manner that  $k$  times the sum of the squares of the deviations of the data from the smooth curve plus the sum of the squares of the third differences of the smooth curve itself be made a minimum, the smooth curve will be such that each of its ordinates will equal a corresponding ordinate of the data plus  $\frac{1}{k}$  times a sixth difference of the smooth curve, i.e.  $u'_x = u_x + \frac{1}{k} \Delta^6 u'_{x-3}$  where  $u'_x$  represents the graduated and  $u_x$  the ungraduated value of the variable.

This difference-equation is extremely troublesome to integrate. If, however, we assign to  $k$  the particular value  $\frac{1}{10560}$ , the equation can be factorized in the form:

$$u_r = -\frac{1}{10560}(20E_6 - 78E_5 + 105E_4 - 50E_3)(50E_{-3} - 105E_{-4} + 78E_{-5} - 20E_{-6})u'_r.$$

Starting with three suitable trial values of  $u'_r$ , the two operations implied by this equation can be applied in succession.

The above summary is necessarily curtailed, because Dr. Macaulay has not provided a detailed mathematical exposition and the original papers are inaccessible. There is no doubt, however, as to the elegance of the method, and to judge from the example given it is also effective.

A final chapter deals with the extension of summation formulæ to cover the range of the data. Dr. Macaulay appears to prefer the introduction of hypothetical data depending upon judgment of the probable course of the curve. Some authorities prefer the fitted curve on the ground that it avoids this very difficulty. But the definiteness of the fitted curve in this respect is quite illusory. The probable error of the fit at the extremities of the range is bound to be high, whatever method one adopts.

The present writer has for some time been experimenting with graduation methods upon historical series and is much impressed with the degree of smoothness and flexibility attainable provided a suitable formula is chosen.

Although such methods involve much time and labour, they have the advantage that one can generally reach the solution on the first attempt. There is no wastage from efforts that have to be scrapped.

L. R. C.

2.—*The Measurement of Man*. By Dr. J. A. Harris, Dr. C. M. Jackson, Professor D. G. Paterson and Professor R. E. Scammon. 9" × 6". vii + 215 pp. Minneapolis: University of Minnesota Press, 1930. Price \$2.50.

This book comprises four distinct sections, "delivered first as lectures under the auspices of Sigma Xi at the University of Minnesota." The first, by Dr. J. Arthur Harris and entitled "The Measurement of Man in the Mass," utilizes to a large extent material which will be familiar to students of the work of Karl Pearson and of his biometric school. It brings together and discusses interestingly a great number of the results that have been obtained in the statistical studies of man's physical measurements and physiological functions, their interrelationships and their inheritance. The clear explanation and illustration of the more elementary statistical constants used in these studies seem to call for only one comment. The author says, "The rigidity with which the interrelationships between stature and length of forearm and between stature and length of finger hold is shown by the orderliness of the distributions of the means of the lengths of these two organs for various grades of stature, as represented in Fig. 13. At the extremes of stature (where the number of individuals is very few) the averages of the lengths of forearm and of the lengths of finger show material deviations from the fitted straight lines. When the numbers of measurements are reasonably large the agreement between the line given by the equation and the actual means is close enough to satisfy the critical worker in the so-called exact sciences of chemistry, physics, or astronomy." It would have been as well to add that even with high correlation (here about 0.7) the variation round the means of arrays may yet be considerable, perhaps too considerable to satisfy this critical worker in the so-called exact sciences, who may require his observations to fall within a very narrow range in each array.

The second section, "Normal and Abnormal Human Types," by Dr. Clarence Jackson, extends the discussion to a comparison of

these physical and physiological measurements of various racial types in the United States. In addition he briefly discusses the influence upon growth of the ductless glands, and the types of body build which are specially predisposed or resistant to the various forms of disease.

Professor Paterson (Professor of Psychology in the University of Minnesota) contributes an extremely entertaining section on "Personality and Physique." He gives an historical background by a short review of the *obiter dicta* of the early physiognomists and phrenologists—for example, Rule LXXIII of Lavater's "One Hundred Physiognomical Rules" informs us that "Women with brown, hairy bristly warts on the chin, especially the under-part of the chin, or the neck, are commonly industrious, active, good housewives, but extremely sanguine, and amorous to folly, or even to frenzy. They talk much, and would willingly talk only of one object. They are easily excited to kindness, but not as easily prevailed on to become indifferent. They must be treated with circumspect, calm friendship, and kept at a distance by a mildly cold dignity of demeanour." He passes to a statistical refutation of some of the laws of modern physiognomic "doctors" (a flourishing profession even in the twentieth century), and thus to modern scientific studies of physique and physical condition in relation to mental traits. His conclusion is, that "With the possible exception of physical factors associated with temperamental characteristics and of disease processes involving the higher centres of the central nervous system, our survey has demonstrated that prevalent notions regarding an intimate relation between bodily traits and mental development have been greatly exaggerated," and, utilizing here the work of Heron and Rogers, that "ordinary physical defects and certain presumably deleterious physical conditions seem to be relatively unrelated to the enormous range of individual differences in intelligence to be seen on every hand."

The final section, by Professor Scammon, deals with the "Measurement of the Body in Childhood," including approximately the first two decades of post-natal life, and the foetal portion of pre-natal life. He distinguishes four main types of growth curves, general, neural, lymphoid, and genital, characteristic of the majority of the organs and parts of the body and of the greater number of the internal and external bodily dimensions, and discusses their variations in rate of growth at different ages. In the foetal period there is a striking uniformity in the curves of growth. During infancy, which may be regarded as a transition period, "the organs and structures of the body are departing, one by one, from the simple style of increment characteristic of the foetus to the diverse and complex modes of growth that obtain in childhood."

Altogether an interesting volume, which avoids giving the student any exaggerated idea of what is already known, but rather suggests the great deal of work that still remains to be done—for example, on predisposition to disease and the relationship between physique and intelligence.

A. B. H.

3.—1 *Treatise on Money*. Vol. I. The Pure Theory of Money. Vol. II. The Applied Theory of Money. By J. M. Keynes. 8½" × 5½". London: Macmillan. 1930. 15s. each vol.

Mr. Keynes apologizes in his preface for the tentative character of his *Treatise*. "The ideas with which I have finished up are widely different from those with which I began," he says. He finds that his approach has been more devious than it might have been, but nevertheless he offers his book to the world at the stage it has reached, "even if it represents a collection of material rather than a finished work." Economists all over the world will applaud his decision to do so. An artist's sketches are often more expressive of his individuality than his finished work. And it will be helpful to those who wish to understand Mr. Keynes's point of view to have his collection of material presented to them in his characteristically living literary style.

Mr. Keynes has a command of language unsurpassed among contemporary economic writers. But does that justify him in assuming a dictatorship of the vocabulary? Some of his definitions are undoubtedly valuable, and may well form an addition to economic language. But others impose on words of common use, such as Income, Profits, Investment and Savings, new and unfamiliar meanings. With a reckless waste of valuable words he assigns identically the same meaning to "income," "earnings" and "costs." In place of what is ordinarily included among incomes under the designation of "profit," he includes the "normal remuneration of entrepreneurs," and he assigns the word profit to any excess of the actual gains of the entrepreneurs over their normal remuneration. (A deficiency is negative profit, or loss.) As an alternative to profits, he suggests for this excess the name "windfalls." It would have been better to employ this word rather than to force an unaccustomed meaning on so common a term as profits, and in what follows I propose to avoid the word profits and to use the expression "windfall gains" (or losses). I shall also use the word income in its ordinary sense to include the actual net gains of the entrepreneurs, and shall reserve the word earnings for Mr. Keynes's use. Thus the costs of production in his sense are composed of the earnings of the community in their capacity as factors of production, and their earnings differ from their incomes by the net amount of the windfall gains of the entrepreneurs.

An analysis based on these definitions requires a definition of the normal remuneration of the entrepreneurs.

It is "that rate of remuneration which, if they were open to make new bargains with all the factors of production at the currently prevailing rates of earnings, would leave them under no motive either to increase or to decrease their scale of operations" (I., p. 125). This definition undoubtedly hides a multitude of complications, and it is a defect in the book that these complications are not explored and elucidated. But the governing idea is one which we can accept in principle. If the actual gains of an entrepreneur exceed his normal remuneration, he would (apart from the limitations imposed by existing commitments) wish to expand his scale of operations; if his actual net gains fall short, he would wish to curtail it.

The normal remuneration of the entrepreneurs is therefore the *equilibrium* rate. A windfall gain or loss is a departure from equilibrium.

Now the actual gains of the entrepreneurs (including traders of all kinds, dealers as well as producers) are equal to the excess of the selling value of their output over the cost of other factors of production (wages, salaries, interest, etc.), and a windfall gain or loss arises simply from a rise or fall of this selling value in comparison with costs. Since costs in Mr. Keynes's sense include the normal remuneration of the entrepreneurs, we can say that a windfall gain or loss is the difference between the prices and the costs of output.

Mr. Keynes's monetary analysis is built upon this difference. It therefore expresses any divergence from equilibrium in terms of a *change of price level* relative to costs. But the phraseology he employs suggests the introduction of quite a different factor. He defines "investment" to mean the net increment of the capital of the community, and, since capital includes liquid capital (stocks of goods) as well as fixed capital and working capital (goods in process), investment is the excess of output over consumption. But output is equal to earnings *plus* windfall gains, "income" in the ordinary sense. Therefore investment is the excess of income over consumption.

"Savings," on the other hand, Mr. Keynes defines as the excess of earnings over consumption. Therefore the difference between savings and investment is identical with the difference between earnings and income and with the difference between selling value and costs of output.

Mr. Keynes's analysis proceeds from certain "fundamental equations," which express relations between price levels and costs and the difference between investment and saving. The equations "are mere identities; truisms which tell us nothing in themselves. . . . Their only point is to analyse and arrange our material in what will turn out to be a useful way for tracing cause and effect" (I., p. 138).

Investment and saving, according to Mr. Keynes, are determined respectively by two quite different sets of decisions. "Saving is the act of the individual consumer and consists in the negative act of refraining from spending the whole of his current income on consumption. Investment, on the other hand, is the act of the entrepreneur . . . and consists in the positive act of starting or maintaining some process of production or of withholding liquid goods" (*i.e.* goods in stock) (I., p. 172).

Here "income" means earnings, not what is ordinarily called income. It is income *minus* windfall gains. Unless the individual recipient of income happens to be an entrepreneur, earnings and income are the same. But, if he is an entrepreneur, does he not exercise precisely the same disposal over his windfall gains as over his earnings? They are indistinguishable parts of what to him is simply income. His negative act of refraining from consumption determines the excess of income over consumption in precisely the same way as it determines the excess of earnings over consumption.



That is to say, investment is determined by the same "decisions" as saving. In fact what Mr. Keynes calls investment is what other people call *saving*.

What then of the decisions of the entrepreneurs as such, and their "positive act"? The decisions of the entrepreneurs determine what may be called capital outlay. But investment as defined includes not only capital outlay, but any accumulation of unsold goods. The "withholding of liquid goods" is the result of the decisions of the entrepreneurs. But the failure to sell output is not; it is the result of the decisions of the consumers who refrain from buying.

Output is composed of capital outlay *plus* the production of consumable goods. The two between them account for all incomes. If the part of incomes applied to saving exceeds capital outlay, then the part applied to consumption falls short of the production of consumable goods. There is a shortage of demand, and a part of the consumable goods remains unsold. Similarly, if saving falls short of capital outlay, the demand for consumable goods exceeds production, and stocks are drawn upon. In either case a discrepancy between saving and capital outlay disturbs equilibrium. But the first impact is felt in an increment or decrement of stocks of goods without any change in the price level, and at that stage there is no difference between investment and saving as defined by Mr. Keynes. No doubt a rise or fall of price level is likely soon to follow. But that is not the only result. For there will probably also be an expansion or contraction of production, and this may precede the rise or fall of price level. The change in price level and the change in production are to some extent *alternatives*. In the one case the rise of prices, when it comes, tends to check the increase in production, and in the other the fall of prices tends to counteract the decrease in production.

Mr. Keynes finds in a windfall loss the cause of unemployment, in that entrepreneurs restrict their operations when their remuneration falls below normal. But now we see that a decline in output, and therefore in employment, may *precede* the fall in price embodied in the windfall loss.

A loss of monetary equilibrium takes effect in three ways. Productive activity, stocks of goods and the price level may all diverge from normal. Mr. Keynes in his fundamental equations unduly narrows the problem by concentrating on the rise or fall of the price level. And the price level in his equations means practically the price level of finished goods, a very tardy indicator.

On the other hand, he says that "it is obviously the anticipated profit or loss on new business rather than the actual profit or loss on business just concluded which influences entrepreneurs in deciding the scale on which to produce" (I., p. 159). But, according to the fundamental equations and the definitions, there can be no difference between investment and saving till the rise or fall of prices is an accomplished fact.

When we come to the practical applications in Volume II, it would probably be a mistake to insist too strictly on the letter of the definitions. Mr. Keynes, in his repeated references to a difference

between investment and saving, usually has in mind the "decisions" which determine capital outlay and consumption outlay. It is to the decisions determining capital outlay that he attributes the predominant part. "A disturbance will seldom or never be initiated by a sudden change in the proportion of current income which is being saved."

It is perhaps owing to his use of the term "investment" that he tends to identify capital outlay too closely with outlay on *fixed* capital. He does indeed discuss at considerable length the outlay on working capital and stocks of goods. But he does not allow that the volume of investment either in working capital or in liquid capital is sensitive to changes in the short-term rate of interest (II., p. 363). Therefore in his theory of credit regulation he is led to the view that the efficacy of changes in bank rate is felt mainly in the investment market and the outlay on fixed capital.

This conclusion, which colours all his practical applications both to history and to current problems, is not supported by any very adequate train of arguments. As to the effect of credit conditions on stocks of commodities, he points to the high cost of holding stocks of some kinds of goods and to the relatively large gain or loss from prospective price fluctuations, as likely to swamp the relatively small gain or loss from bank interest. But it is quite sufficient that for some kinds of goods the cost of holding stocks should not be large, and the charge for bank interest relatively considerable. And as to expectations of changes of price, it is well recognized that changes of bank rate must be considerable enough to offset such expectations in order to be effective.

The positive side of the argument, which is required to demonstrate the response of outlay on fixed capital to bank rate, is developed in a rather disconnected way. At the outset Mr. Keynes finds a direct relation between the long-term rate of interest and the price level of capital goods. "The demand price of capital goods" depends on their "prospective yield," and on "the rate of interest at which this future yield is capitalized" (p. 202). Bank rate affects the long-term rate of interest, and if the latter rises, the effect on the price of capital goods is "immediate, direct and obvious."

It is rather startling to find an economist of Mr. Keynes's authority and standing enunciating such a proposition. That a rise in the long-term rate of interest will *tend* to diminish the demand for capital goods (or their "demand price") may be readily conceded. It will act through the investment market by diminishing the volume of new issues. But the effect, however "obvious," is only "immediate and direct" in an academic realm of curves.

In Volume II this position is modified. "Almost the whole of the fixed capital of the world is represented by buildings, transport and public utilities; and the sensitiveness of these activities even to small changes in the long-term rate of interest, though with an appreciable time-lag, is surely considerable" (II., p. 364).

There remains the question of the sensitiveness of the long-term rate of interest to the short-term rate. Mr. Keynes has to meet the objection that "whilst it is reasonable that long-term rates should

bear a definite relation to the prospective short-term rates, quarter by quarter, over the years to come, the contribution of the current three-monthly period to this aggregate expectation should be insignificant in amount" (II., p. 352).

He relies in the first place on an empirical argument. He quotes statistical calculations showing a correspondence between long-term and short-term rates both in New York and in London since 1919. And he draws the inference that "short-period fluctuations in bank rate are four times as wide as those in the yield on Consols" (p. 355). He then finds certain psychological grounds for the effect of the short-term on the long-term rate being exaggerated beyond what might have been theoretically justified. No one would deny that this might occur. But the statistical argument is fallacious. It leaves out of account the effect of movements in the price level upon *both* long-term and short-term rates of interest. A monetary expansion, by raising prospective profits, tends at the same time to raise the short-term rate of interest and to depreciate fixed-interest-bearing securities. A monetary contraction has the contrary effects. The resulting correspondence between short-term and long-term rates is to be attributed not to the effect of one upon the other but to the response of both to a common cause.

Mr. Keynes's position thus appears to be that bank rate does not materially affect borrowing for the purpose of holding commodities, and that the control of monetary conditions has to take effect first through the influence of bank rate upon the prices of securities and then through the influence of the prices of securities on new capital issues. To say that this occurs "with an appreciable time lag" is to put it mildly. Credit regulation under such conditions would be like Wonderland Croquet with flamingoes for mallets and hedgehogs for balls. No wonder that Mr. Keynes is inclined in certain circumstances to recommend that the Government should take the initiative in starting capital outlay.

Mr. Keynes makes an interesting analysis of the stock of money and bank deposits. (1) "Income-deposits" are "replenished by individuals out of their personal incomes and employed by them to meet their personal expenditure and their personal savings." (2) "Business-deposits" represent the difference between the receipts and outgoings of "a business man, a manufacturer or a speculator." (3) "Savings-deposits" are held "not for the purpose of making payments but as a form of savings" (I., pp. 35-6). These distinctions cannot be rigorously maintained, but they form a useful classification of the motives and usages by which changes in balances are likely to be governed.

Mr. Keynes lays stress on the variations in savings-deposits, particularly on the tendency in certain conditions for people to hold money on time deposit by way of a "bear speculation," *i.e.* withholding it from investment (here used in the ordinary sense of buying securities). He sometimes refers to this as causing an excess of saving over "investment," apparently forgetting that the purchase of securities is not necessarily equal to investment in the other sense (*cf.* pp. 141-3).

I venture to doubt whether savings-deposits play precisely the part that Mr. Keynes assigns to them. The ordinary investor does not often play the part of bear, in the sense of delaying investment on the ground that stocks and shares are overvalued by the market. He plays the part of bull when he obtains an overdraft to buy an investment which he thinks is undervalued, and a bear sentiment among investors is felt mainly in a diminution of such overdrafts. The stagnant balances which are so characteristic of periods of depression are composed rather of the idle working capital of industrial and commercial concerns.

Space does not permit reference to all the interesting features of Mr. Keynes's Treatise. Mention should be made, however, of his discussions of Index-Numbers (Book II.), of the Credit Cycle (Chapters 18-20), of the International Aspects of Credit Regulation (Chapters 21, 34-6, and 38).

It is noteworthy that Mr. Keynes is now disposed to acquiesce in a gold standard and to aim at an internationally managed money through it, "in spite of the disastrous inefficiency with which the international gold standard has worked since its restoration five years ago (fulfilling the worst fears and gloomiest prognostications of its opponents), and the economic losses, second only in amount to those of a great war, which it has brought upon the world" (II., p. 338).

R. G. H.

4.—*The Fall in Prices.* By John A. Todd.  $8\frac{1}{2}'' \times 5\frac{1}{2}''$ . 68 pp. London: Oxford University Press. 1931. 2s. 6d.

Mr. Todd's small book provides the non-technical reader with a convenient introduction to current discussions on the respective responsibilities of what are termed monetary and non-monetary factors in producing the recent dramatic fall in world prices. It sets out to give "a brief account of the facts, the probable causes and the possible cures." So far as the first of these is concerned, Mr. Todd can claim to have fulfilled his task, though exception may perhaps be taken to the scantiness of his historical treatment of the monetary factors. He is inclined to over-stress the influence of gold production and to ignore the part played by paper money and credit inflation, especially in the violent price fluctuations of the late eighteenth century and early nineteenth. Referring to the fluctuations of gold production and prices shown in a chart covering the period 1785 to 1930, he says, "an examination of these proves that gold production could have had very little to do with the question up till the middle of the nineteenth century, because the world's total production until then was negligible, and varied very little."

Since this earlier period includes such important movements as those of the years 1793, 1810-11, 1825-26 and 1837, which are generally considered to have been in a large measure a result of excessive over-extensions of either credit or paper money circulation, there is a danger that the ordinary lay-reader may be misled into believing that it is possible for large fluctuations in the price level to occur without the intervention of monetary factors; an inference which can scarcely be made on the evidence available for the period

charted. His treatment of the non-monetary factors is more satisfactory. The inclusion of a diagram showing the individual movements for the years 1929 and 1930 of the separate groups of wholesale commodity prices included in the Board of Trade Index is to be commended—though it is perhaps to be regretted that it was not taken back over a longer period of years—for it helps to bring home the very unsubstantial character of that much misunderstood conception “the general price level.” The diversity and complication of the separate movements comprised in it are apt to be dismissed too lightly by those who suggest that such an average might serve as a practical guide to Central Banking procedure.

Mr. Todd's main conclusion is that conditions of supply and demand, rather than monetary causes, have been the major influence in the present decline. That he is not wholly satisfied with his diagnosis, however, is suggested by the fact that although in his chapter on “Possible Cures” he says that an immediate cure for the present situation is “a reduction of retail prices so as to promote production,” he adds, “the position is too uncertain to say dogmatically that that is the *whole* cause of the trouble, and therefore all that is wanted to cure it.”

Mr. Todd would probably submit to classification with that small but growing body of investigators who refuse to be satisfied with either explanation, on the grounds that they both tend to oversimplify the problem and take insufficient account of such dynamic factors as changes in the flow of savings and investment, and fluctuations in the speed of commercial evolution. The roots of the present depression, when traced back to the War period, reveal extensive over-investment in a very large range of commodities, if judged from the point of view of the world's future normal needs, as well as a redistribution of the world's gold supplies in proportions unadjusted either to the special needs of the individual Central Banks or the investment policies of the countries concerned.

While it is doubtless true that these maladjustments have in part been rectified by events over the past decade, it cannot be denied that international trade taken as a whole has never recovered its pre-war mobility nor come anywhere near re-establishing that unified system of development and interchange under which Great Britain's foreign trade reached its zenith.

Until something approaching order is re-established in the basic parts of the international machine we are likely to look in vain for a solution to our problems among the factors analysed by Mr. Todd.

R. G.

5.—*Changes in the Structure of World Economics since the War.* By Dr. Felix Somary. 7¼" × 5". 221 pp. London: P. S. King, 1931. 7s. 6d.

Appreciation of the contemporary spirit of Europe, the problem of sifting out from heterogeneous masses of speeches, manifestos, plans, memoranda, newspaper articles, and statistics, some intelligible and co-ordinated account of current social movements, and separating the accidental from the essential and the visionary from

the practical, demands a rare combination of qualities and aptitudes. Dr. Somary is a distinguished writer on economics as well as a practical banker: in his person are joined the detachment of the thinker with the balanced judgment of the man of affairs. His analysis of the world situation from the standpoint of economic liberalism, particularly the chapters dealing with "Russia" and the "Economic Outlook of the Individual and the State," is penetrating and suggestive, and should be read by everyone interested in the world economic situation.

L. R. C.

6.—*Report on the Sugar Beet Industry at Home and Abroad.* Economic Series No. 27 of the Ministry of Agriculture and Fisheries. 9 $\frac{3}{4}$ "  $\times$  6". xviii + 293 pp. London: H. M. Stationery Office. Price 6d.

This report is divided into six parts, including the introduction and the conclusion. After outlining the sources and uses of sugar, Part I gives a brief historical review of its introduction into Europe and several Tables showing world production and consumption by countries for 1930–31, with comparable figures for the pre-war years. Part II traces the development of the industry from the discovery of sugar in beet and the establishment of the first factory in Silesia in 1801 to the British Sugar (Subsidy) Act, 1925, and its results. Paragraph 112 on the "Effect of the Subsidy" does not deal adequately with this very important consideration, and only gives a bare comparison of the acreage, number of growers, employment, etc., in 1923 and 1930. It is not proved that the larger figures in 1930 are wholly attributable to the subsidy, for it is possible that the sugar beet industry has received some stimulus by reason of the heavy losses incurred on other crops. The "Agricultural Survey" given in Part III is extremely interesting. Sugar-beet seed breeding abroad and production at home, with the results of variety trials are discussed at some length and lead to an account of cultivation processes and harvesting methods. The most interesting chapters in this part, however, are those dealing with the problems of farm labour and production costs. Hours of work, rates of pay, and the "real value of wages" are tabulated for seven beet-producing countries, together with details indicating the relative efficiency of field labour. Taking the hours worked per ton of beet in Great Britain as 100, the figure for Germany is 108, for Holland 91, and for France 66. The total production costs at home and on the Continent are taken from authoritative sources, but, as the Report says, "are admittedly open to criticism." It is evident, however, that much care has been taken to compile an informative set of tables from the material available, and if the reader has any adverse criticism to offer it should be directed to the paucity of original data rather than the treatment given to them in the Report. It is concluded that although continental costs per acre are much the same as those in this country, the higher yield obtained abroad gives the continental grower a distinct advantage. Part III closes with an account of the organization of education and research in respect of farm operations in Great Britain and a chapter on the transport of beet from the field to the factory.

Part IV is concerned with an industrial survey of the industry, giving an account of the factory operations. Problems of factory labour—including its highly seasonal nature and wages—and factory organization are discussed, and attention is given to certain aspects of capitalization and finance. Capacity and factory throughput also receive consideration. Chapter XVI dealing with factory output and costs of production is of outstanding interest and value. It is somewhat surprising to learn that of the 2,373 shareholders in the beet sugar factory companies, 5.7 per cent. are known to be foreign, and that this small proportion hold one-third of the total share capital. The average holding per British shareholder is £1,400 compared with £11,297 for the alien shareholder. Capital expenditure on factory development, sources of plant and machinery, balance sheets, and profit and loss accounts are, *inter alia*, discussed. Comparative costs of British and foreign factories are given and the taxation of the Companies is considered. This chapter is, in effect, an exhaustive enquiry into the economics of factory production. Education and research in the technical processes of manufacture and the transport of sugar and by-products conclude a very valuable contribution to our knowledge of the industry.

Part V, entitled "Commercial Survey," begins with an outline of sugar taxation and State assistance. Precisely why "the tax (i.e. sugar duties and excise) so paid is passed on to the consumer in the sugar price" is not too clearly demonstrated. Modern methods of State aid are described and a brief history of sugar taxation since 1901 makes interesting reading. The working of the subsidy on home-grown sugar and the differential duty on imported raw sugar, both complicated questions are clearly discussed. In the chapter on the marketing of sugar the outstanding problems of raw materials, over production, and control schemes are described, as also are the conclusions reached by the Economic Committee of the League of Nations in 1929, the International Conference of Producers and the position of the West Indies and Mauritius. The beet price question receives a chapter to itself and price negotiations at home and abroad are considered. Part VI consists of the concluding observations, reviewing the progress and prospects of the industry. It is regretted that the sum of £27½ million retained by the sugar beet industry since 1924-5 is not traced to the ultimate beneficiaries as between the refiners, factories, and growers. The share retained by the factories would have been especially interesting in view of the capital holdings of alien shareholders. Nevertheless, this Report is certainly a very important survey of the industry and justifies the departure from the Civil Service tradition of anonymity of authorship. Profusely illustrated, containing 92 Tables and 11 Appendices, its price at 6d. represents only a fraction of its value.

R. F. G.

7.—*The Japanese Population Problem—the Coming Crisis.* By W. R. Crocker. 8½" × 5½". 240 pp. London: Allen and Unwin, 1931. Price 10s. 6d.

It is pointed out in the preface that the population question in

Japan is especially interesting at the present time, since, firstly, it is a living case of "over-population," secondly, because of its influence on the international relationships of the Pacific, and, thirdly, on account of the light it sheds on the existing conditions of several other countries to-day. The book is almost entirely concerned with the first of these reasons.

The opening chapter outlines the position of Japan in relationship to her Asiatic neighbours mainly from the economic aspect, and leads up to a short consideration of the major issue—the pressure of population with its persistent outward thrust. In discussing the geographical, historical, and cultural background of modern Japan there is little that has not already been said elsewhere, although there is a fair justification for stressing these well-known facts when approaching the population question.

Whether a population problem really exists is said to be no foregone conclusion, since the pressure of numbers continues to increase alongside a rise in the general standard of living. The author rightly stresses that the real criterion does not lie in a comparison between present conditions and optimum density, but between present conditions and those of the recent past. Thus the tests considered concern national wealth, national income, *per capita* consumption (of rice), real wages, and the position of agriculture in the light of non-proportionate returns. Wealth, income, rice consumption, and real wages have each shown a very definite upward trend. To determine whether Japanese agriculture has passed the point of optimum returns, the author would have been satisfied with statistics showing the amount of fertilizers expended over recent years on raising a bushel of rice, but these figures, in fact, are not available. He is, however, convinced from observation that a bushel of rice in the last decade has been taking more fertilizer to produce. This conclusion, with the evidence showing that a greater amount of labour is expended per acre now than formerly, indicates that the point of optimum return has actually been passed. Agriculture in Japan, like that of all other countries, is to-day experiencing serious adversity, and poverty is widespread among the farming classes. Improvements in cultivation and harvesting are expected to result not in larger yields but in a reduction of the labour at present expended. More intensive methods thus seem to offer no solution to the problem of Japan's future food supply, and the possibility of extending the arable area is also considered very remote. A significant change in Japanese diet is, however, gradually becoming apparent, especially in the cities. The conclusion is reached that Japan must look in the future to overseas countries for her food supplies (especially since her rice is costing too much to grow), and her capacity to pay for imports will depend on her industrialization.

When considering the future of Japan's population, figures are given which bring out the decline in the marriage rate and in the fecundity of women of child-bearing age, especially in the larger urban areas. Contraception is also expected to exert an increasing influence. On the other hand, the age composition of the female population clearly shows that the percentage of child-bearing women



in the next generation will be much larger than it is to-day. On balance, an increase within the next generation of 15 to 20 millions is expected.

A good deal of space is devoted to the changing ratio between world production and world commerce, and metals and energy resources. The argument is then reached that if there is to be a self-sufficing iron and steel industry, it can only be in Manchuria. A certain compensation, however, may be found in Japan's potential hydro-electric power. The prospects of the silk industry are far from reassuring and, realizing this, Japan is establishing a very substantial rayon industry to take its place. A high degree of efficiency is already evident in the processes and organization of the cotton industry, from which, more than any other, much is expected. Having reviewed the present position of Japan's foreign trade it is finally concluded that her salvation by way of industrialization is not beyond hope. Any relief that might be achieved through emigration can only palliate the population problem and cannot afford any hope of a permanent solution.

A concluding chapter, two appendices, one on the difficulty of using the statistical method throughout the investigation and the other on rice culture in Japan, and twelve pages of bibliography complete the book. It is a very readable and interesting study, but one is somewhat disconcerted, after reading several pages, to find that "much of the above discussion can be judged by the reader for what it is worth" (p. 154). That is surely for the author to do! The units (thousands) are omitted from the Tables on pp. 89 and 90. Finally, judging from the figures on pp. 81 and 89, the total number of females in Japan (1925) given on p. 90 as 29,273 (presumably "thousands") should read 29,723,000. R. F. G.

8.—*An Introduction to Medical Statistics*. By Hilda M. Woods and William T. Russell.  $7\frac{1}{2} \times 5$ ". x + 125 pp. London: P. S. King, 1931. 7s. 6d. net.

In an introductory preface, Professor Greenwood explains that this little work, by Miss Woods, Assistant Lecturer of the London School of Hygiene and Tropical Medicine, and Mr. Russell, of the Statistical Department of the Medical Research Council, has been written to meet the needs of a special class of student. Year by year, in the Division of Epidemiology and Vital Statistics, a large class of young medical men and women comes under instruction, few of whom have anything more than a knowledge of mathematics of matriculation standard, and that often half forgotten. They have no time to refresh or extend their knowledge of mathematics, and to the whole subject, viz. the history of the prevalences of disease, the compilation of statistical data and the analysis of such data, they cannot give as much time as would form a normal year's course in statistical method alone. Plainly, as Professor Greenwood says, it is not possible in such circumstances to turn out finished statisticians. "We hope, however, that we may give sufficient instruction to enable every student to understand and carry out the statistical operations which a Medical Officer of Health *must* super-

vise, and to encourage many students to extend their knowledge. We believe that when a student has acquired facility and confidence in carrying out the simpler operations of statistical analysis, he will usually wish to go further. The object of this little book is to help him to acquire such facility and confidence." It seems, indeed, admirably adapted to that purpose: exposition is excellently clear and well simplified, and the amount of ground covered in small space shows skilful selection and compression.

There are eleven chapters. Chapter I, "Vital Statistics," deals briefly with the Census (the questions at the English censuses of 1801 and 1921, methods of enumeration by official enumerators and by householder's schedule, *de facto* and *de jure* populations)—registration of births and deaths, and their history, still-births, registration of sickness. Chapter II then proceeds to tabulation: qualitative classification, quantitative classification and choice of class-interval, practical methods of compiling the distribution by entering on a sheet or by cards. Chapter III gives some useful hints on the construction of charts and graphs, and Chapter IV deals with the elementary methods of handling population and registration data—the calculation of a total population for a year intermediate between two censuses, the crude death-rate and crude birth-rate, with some useful hints on elementary points such as the calculation of an average rate for two districts, death-rates at ages, infant mortality, proportional mortality and so forth. In the next chapter the student is introduced to the important subject of standardisation, a piece of very good and well-illustrated elementary exposition. After this there is a break from vital statistics to general method, Chapters VI to IX dealing with averages, dispersion, correlation and regression. In Chapter X—the reason for the position of this chapter is not very obvious—we return to a special subject of vital statistics, life tables, a chapter which the reviewer would be inclined to select as one of the best pieces of clear and succinct exposition in the book, and a noteworthy feat of compression—in seven pages! The book concludes with quite a useful little chapter on sampling.

Any student who has worked carefully through the course should be well prepared to go further and tackle critically such books on pure vital statistics as Newsholme or Whipple, or brace himself to Raymond Pearl's *Medical Biometry* and advance his knowledge of general method.

The reviewer has found little to criticize. In some of the worked-out examples he would have been inclined to retain fewer digits: the user of a calculating machine can light-heartedly work with a lot of figures, knowing that he can always cut down his answer to a reasonable length and has made sure that the final digit is right, but the elementary student, so far as his own experience goes, mainly doing his arithmetic "by hand," is apt to be frightened by a lot of figures. A paragraph about the number of digits to retain in a final answer might well be added, say, to the chapter on sampling. On a question of fact, is it correct to say that (Chap. IX, pp. 49-50) "In England and Wales the census population of 1901 has for many

years been used as the standard because the composition of the population in 1901 was favourable to a low death-rate"? The reviewer's impression is, it was simply a result of the decision to use a fixed standard population having been made in 1911. In previous Decennial Supplements the population of the decade had been used as the standard, so that successive Supplements were not comparable. When it was decided in, or rather just prior to, 1911 that continuity and comparability would be obviously preferable, the natural thing to do was to use the population of 1901—a decision which had the further advantage that the United States had decided to use this standard. The fact that it is an exceptional and optimum population from the standpoint of death-rates makes it rather a bad standard. Sundry printer's errors, in the way of subscripts printed on the line and so forth, can well be amended in the next edition, which is sure to be called for. If that edition is also extended, the reviewer would plead for the inclusion of a chapter on the trustworthiness of the data (*cf.* Major Edge's paper in the *Journal* for 1928), on the difficulties of comparison due to continually changing classifications both in census and registration data, to improvements in diagnosis, and so forth. G. U. Y.

9.—*A Review of Certain Present Aspects of Small-Pox Prevention, in relation particularly to the Vaccination Acts, 1867-1907.* Ministry of Health. 9 $\frac{3}{4}$ "  $\times$  6 $\frac{1}{4}$ ". 67 pp. London: H.M. Stationery Office, 1931. rs. net.

This most interesting Report will be looked at carefully from many differing points of view. The reader with quite an open mind is likely to be intrigued to the extent of studying the subject further, a consummation of course devoutly to be wished: the critic of vaccination may here and there detect a sentence to be added to his armamentarium for future use: the man who "knows his small-pox" will probably feel after studying the Report, that while it pleads most persuasively for compromise, here and now, it suggests certain modifications of practice which may prove a source of real trouble in years to come. The student of statistics will note the absence in the concluding paragraph on p. 20 of any reference to decline in "percentage of vaccination to births"; but later (p. 61) in the Summary it is appropriately pointed out that "The protection methods which are part of ordinary English administration . . . include vaccination." The statistician will note, too, the Report's insistence on the immunity of protected hospital staffs (Table on p. 7), reinforced as it is by a sentence near the middle of p. 46 and by the final paragraph on p. 18; he will doubtless rejoice, moreover, when he finds the author of the Report taking his courage in both hands in the middle paragraph of p. 35; and he will (of course) approve the closing references to German thoroughness on pp. 65 and 66. The citizen of the world, on his part, will be pleased to find due stress laid upon "International Considerations," and he will remember the footnote on p. 28; but he may wonder why attempts, made in Holland and other countries, "to secure that the whole population is maintained throughout life, or in any case

from infancy well into adult life, in a state of immunity," should not be deemed "practical politics" in Jenner's own country. Finally, the epidemiologist, on stumbling across the third paragraph on p. 39, will think reference should be made here to the "Hypothesis of fortuitous overlapping," of vaccination and encephalitis, discussed in both the Andrewes and Rolleston Committees' Reports. There is, indeed, on p. 43, brief allusion to the "Bristol group" of October 1927, "when within four weeks some 9,000 vaccinations were performed on children of school age, and seven cases of post-vaccinal disease occurred." Reference to the Further Report of the Committee on Vaccination of 1930 (p. 15) shows, however, that one of these seven children was unvaccinated. It will be seen that there were nine cases of nervous disease and seven schools. "At each of six one case of nervous disease followed vaccination. Two of the non-vaccinal cases were below school age, and the third attended the only school at which no case occurred after vaccination." As there were 9,000 vaccinations of children in the "special area," it seems that the proportion, one non-vaccinal case to six vaccinal cases, was just about what might have been expected. The numbers in this Bristol group—as in each one of the small and sparsely scattered groups in the literature of so-called "post-vaccinal" encephalitis—are far too small to base final judgment upon, but in the aggregate the total figures unquestionably raise doubt as to whether anything more than mere chance coincidence has ever been in question.

Sir John Simon, in an often-quoted passage (*English Sanitary Institutions*, p. 124), alluding to Jenner and other "departed great benefactors of our race," referred to the words of Ulysses in *Troilus and Cressida* (Act III, Scene 3):

"Time hath, my lord, a wallet at his back  
Wherein he puts alms for oblivion,  
A great-sized monster of ingratitudes:"

Jenner's reputation will resist the ravages of time for centuries to come, but here it may perhaps be noted that Ulysses (in his speech quoted) added the following words of advice to the listening Achilles—advice which might well be given, nowadays, to any hesitant Public Health Authority:

"The cry once went on thee,  
And still it might and yet it may again,  
If thou wouldst not entomb thyself alive  
And ease thy reputation in thy tent."

W. H. H.

10.—*The Incidence of Illness among Wage-Earning Adults*. By Dean K. Brundage. 10" × 7". 63 pp. Reprinted from the *Journal of Industrial Hygiene*, Vol. XII, No. 9, November 1930. —*The Nervous Temperament*. By Millais Culpin and May Smith. 9½" × 6". iii + 52 pp. Report No. 61 of the Industrial Health Research Board. London: H.M. Stationery Office, 1930. 1s. net.

Our knowledge of the health of industrial workers, both in general and in particular occupations, has been largely based in the past

upon the information afforded by mortality statistics. Such statistics have obvious limitations; they afford no information concerning the mass of sickness that does not terminate fatally, or at least enters very infrequently into mortality returns. Certain conditions of work, or other environmental causes, may predispose to illness or chronic disability which may not terminate in death for many years. Such insufficiencies in death statistics have led to an increasing interest in sickness data, and to various attempts to collect such material. The purpose of Dr. Brundage's report is to review some of the industrial morbidity data that have been collected and analysed in America in recent years, and to present the results that appear to be "the most interesting and illuminating." This purpose is carried out very effectively, and the paper contains a good deal of useful information relating to causes of absence from work, due to sickness, in relation to season, age, marital state, selection, severity of work, and other like factors. An interesting comparison of two companies is shown, one of which paid full wages and the other no wages during sickness. A much higher rate of sickness of short durations was found amongst the operatives paid full wages. Evidence that this was not due to malingering was supplied by the provision of a full-time physician who called at the homes of employees reporting themselves as unable to work on account of illness. He found that malingering was a negligible factor. What really happened was that the employees tended to stay at home for slight ailments, especially colds and other minor respiratory diseases. Those who were not paid during sickness remained at their work and "maintained contact with others while sick or half-sick with communicable diseases. Lack of provision for sick leave falls heavily upon the employee and militates against improvement in the public health."

The number of factors, physiological, economic, and administrative, that are involved in producing a sickness rate is so large that interpretation of the meaning or origin of the rate is often extremely difficult. (Dr. Brundage is not always critical enough to satisfy.)

The very able and entertaining report on the Nervous Temperament by Professor Culpin and Dr. May Smith adds still another weight to the already considerable load of doubt. Studying over a thousand subjects employed in varying types of work, they show the heavy incidence of nervous symptoms that exists in different social grades, and, in addition, show the tendency for the nervous persons to have more sick leave, not necessarily of the type diagnosed as nervous. Such figures must considerably influence our reactions to, for example, Dr. Brundage's conclusion that the second most important group of causes of illness was the "digestive diseases."

This bearing on sickness statistics is only a small point in this report of the Industrial Health Research Board, which deserves to be widely studied. New ground is broken both in technique and in scope of investigation, and the report is written in such a way that very few people will fail to find it interesting. The incidence of nervous symptoms found in the "every-day" population studied

is related to such factors as occupation, age and sex. The layman would expect to find a correlation between the severity of nervous symptoms and industrial efficiency, and this the authors show to exist. An exception seems to be the "obsessional," many of whom are graded by their superiors as "very efficient." The authors also show correlation between the results of assessment and the distribution of stigmata of discomfort—inability to bear noise, dissatisfaction with one's work and environment—which, "whatever may be the stringency of association with objective efficiency, are important elements of the success, or want of success, of human life." A particularly intriguing point is the quite definite relationship between the assessment of the individual (according to the amount and severity of nervous symptoms) as the result of a single interview with the psychologist and the performance of the same individual in the McDougall-Schuster dotting test. That finding, as the authors point out, is a "sufficient proof that the medico-psychological assessment is no mere individual caprice."

That these studies will be extended and not lack practical application in industry in the future should be ensured by Dr. Millais Culpin's recent appointment as Professor of Medical Psychology at the London School of Hygiene and Tropical Medicine.

A. B. H.

11.—*Illiteracy in the United States*. By Sanford Winston, Associate Professor of Sociology, North Carolina State College. xii + 168 pp. The University of North Carolina Press. London: Oxford University Press. 1931. 13s. 6d. net.

A question relating to illiteracy has never been a part of the English census. It must suffer from many of the drawbacks to which queries dealing with infirmities are subject. Such questions are generally agreed to be unsatisfactory; firstly, on account of the difficulty of framing a suitable form of enquiry defining the degree of disability which it is desired to include in the tabulation, and, secondly, because the definition has to be applied by householders with no technical knowledge, who will interpret it in different ways, and many of whom have a natural reluctance to admit that they or their relatives suffer from any defect—at least to the degree referred to in the enquiry. In fact the Census Commissioners of 1881 wrote that "statements made by persons as to the deficiencies, mental or bodily, of their children or other relatives are not worth the cost and labour of collection and tabulation." The objection to a question on illiteracy may not be quite so definite as this, but it is probably not far removed from it. In the United States census illiteracy, as defined by the Census Bureau, signifies "inability to write in any language, not necessarily English, regardless of ability to read." In general, they say, "the illiterate population as shown by the Census figures should be understood as comprising only those persons who have had no education whatever. Thus the statistics do not show directly or definitely the proportion of the population which may be termed illiterate when the word is used to imply lack of ability to read and write with a reasonable degree of facility; but

they do afford a fairly reliable measure of the effect of the improvement in educational opportunities from decade to decade."

In the first half of this book Professor Winston shows the trend in the illiteracy rates between 1870 and 1920—for the States as a whole the fall is from 20 per cent. illiterate to 6 per cent.—and analyses the statistics with regard to sex, age, urbanization, nationality and school facilities. He concludes that if no further efforts were made to reduce the illiteracy rate and provided conditions remained the same, it may be assumed that the illiteracy rate for native whites of native parentage would approach 1 per cent. as those persons in the older age periods die.

The second half of the book begins impressively—"the chief importance of the study of illiteracy as a societal phenomenon is its relation to other societal phenomena"—but results in a rather superficial statistical analysis of the relationships between illiteracy and the birth-rate, infant mortality rate, early marriage, size of family, mobility, suicide and urbanization. The correlations found only raise such questions as what exactly "illiteracy" is a measure of, and whether other correlated factors have been adequately taken into account. The author has held constant two other factors, degree of urbanization and income level, but the fact, for instance, that he finds no correlation at all between income and infant mortality suggests that his measure of income is not likely to be an adequate one. It is difficult to suppose, either, that "inability to write in any language," *per se*, should add to a woman's risk of becoming pregnant. The author, though his study is in many ways interesting and suggestive, does not pay nearly enough attention to the meanings and possible origins of his correlation coefficients

A. B. H.

12.—*Arbitration Principles and the Industrial Court*. By Mary Theresa Rankin, M.A., D.Phil. viii + 178 pp. London: P. S. King, 1931. 7s. 6d. net.

This volume, by the author of *Industrial Conciliation and Arbitration in Australasia*, is primarily an analysis of the decisions given by the Industrial Court established under the Industrial Courts Act, 1919, and a criticism of the reasons assigned by the Court for their decisions—where reasons are given. The decisions brought under review extend from December, 1919, to December, 1929, and are divided by the author into three groups, viz. those given (1) in a period of rising prices and industrial activity, (2) in a period of rising prices and falling industrial activity, and (3) in a period of falling prices and industrial depression. The volume perhaps had its origin in a desire to test and measure the extent of the claim put forward in Lord Amulree's book on *Industrial Arbitration*, that the Industrial Court had "taken the first tentative step towards the formation of a body of industrial case law." The criticism of the principles and reasons set forth in the various decisions, while entirely fair and not meticulous, is rigorous and searching and at times devastating. It may be said at once that if there exists any scientific law (or principles) which can be applied to the settlement

of claims for the variation of wages, such law (or principles) does not emerge from the decisions of the Industrial Court. This is not to say that the decisions of the Court are "wrong" or "unfair" in any way. They can all be defended or explained from one point of view or another, and no doubt most of them secured substantial if modified approval. In a number of cases, however, it seems clear that there has been some change in the attitude of the Court with regard to the weight to be attached to such considerations as "subsistence level," "cost of living," "fairness," "state of the industry," "general industrial situation," and others, apart from anything in the evidence under consideration or from a changed outlook brought about by the efflux of time. Differences of this kind render it difficult to see how principles can be established and precedents fixed even on the most general lines in a Court which can only deal with questions voluntarily submitted and which has no powers of compulsion. The author of the volume before us puts forward as the three principles for an Arbitration Court, subsistence, fairness, and what the industry can in reason bear, with an overriding principle, "the ability of industry in general," and while agreeing with the spirit of these, the difficulties of interpretation are so great that their enunciation does not help us much. Surely the underlying condition to be secured first of all is that implied by the author herself where she refers to the "views of the parties before them" (the Court), by which, we take it, is meant a broad general agreement on the part of employers and workpeople as to what classes of evidence should be submitted or considered relevant. Such agreement does not appear to be forthcoming at the present time, and until it appears the Court will no doubt confine itself to doing its best to carry out Lord Amulree's ideal, "that each case should be considered on its own merits and not by reference to facts and circumstances beyond the interest and concern of the parties."

There is a very acutely reasoned chapter as to whether wages should be regulated on a craft or district basis or on the basis of the industry itself. The author claims that the craft principle alone can give consistency to wages decisions, and is one on which rests the only hope for any rational co-ordination of wages awards. After her review of the decisions of the Court applying to monopolies and Government and municipal services we feel that she has made out a case very difficult to rebut.

W. A. B.

### 13.—Other New Publications.\*

*Bass (Jack)*. *Contabilidad del Comercio Moderno*. 9" × 5 $\frac{3}{4}$ ". 282 pp. Buenos Aires: Published by the Author, 1930.

[The author has been practising as an accountant in the Argentine Republic for nine years, and his book is intended as a guide to modern practice for students of accountancy in that country, where old methods in large variety are used. The instruction is fundamental, thorough, and clear; four chapters are devoted to costing, one to elementary commercial statistics; and the last chapter, making about a third of the

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\* See also "Additions to Library," pp. 664 et seq.



whole book, consists of a description, with illustrations, of various calculating machines, loose-leaf systems, and other devices in current use. An index is provided for this section as well as for the main portion of the book.]

China Year Book, 1931. Edited by *H. G. W. Woodhead*, C.B.E.  $8\frac{1}{2}'' \times 5\frac{1}{2}''$ . xvi + 728 pp. Shanghai: North China Daily News (London: Simpkin, Marshall), 1931. 42s.

[Since the issue of the 1929-30 edition (noticed in the *Journal*, Vol. 93, 1930, p. 300), publication has been transferred from Tientsin to Shanghai. The new publishers have reset this edition in a more compact style, so that while the amount of letter-press has been increased, the bulk has been reduced by about 500 pages. Some new features include chapters dealing with imports, recent scientific activities, treaty negotiations, and opium, and the greater part of the book has been entirely rewritten.]

Clarke (*John J.*). *Outlines of Local Government of the United Kingdom (and the Irish Free State)*. 9th ed.  $7\frac{1}{4}'' \times 4\frac{3}{4}''$ . viii + 246 pp. London: Pitman, 1931. 5s.

[A new section has been added on local authorities in relation to transport, and many chapters have been revised, chiefly in order to embody the effects of recent legislation.]

Das (*Rajani Kanta*), M.Sc., Ph.D. *Plantation Labour in India*.  $8'' \times 5''$ . 194 pp. Calcutta: R. Chatterjee, 1931. Rs. 3.

[The author, who was formerly a lecturer in economics at New York University and at one time an official of the United States Bureau of Labor Statistics, states that this study was undertaken in order to call attention to conditions which are in great need of improvement. Owing to the scantiness of the information available for other regions, the book is almost entirely confined to the tea-gardens of Assam, which in any case account for the majority of Indian plantation workers and with respect to which it forms a pretty complete work of reference. The statements made and the conclusions drawn are based on ascertained figures, mostly derived from official sources, and evidently no pains have been spared to make the study exhaustive and impartial. One of the most important problems is the recruitment of labour; the climate and conditions are not congenial and the workers have to be brought from a distance; hence it is difficult to obtain any but the lowest class. In the past the supply of contractors and the indenture system gave rise to grave abuses, which have now been remedied, as have some other of the worst grievances, by legislation; but the author finds that "insanitary conditions, long hours, heavy work, and low wages . . . still exist in most of the gardens." He suggests that improvement depends largely upon the raising of the general level of education of the people, advocates the establishment of public employment bureaux, and urges the necessity of so amending the conditions of employment as to attract a better class of worker. Plantation, he points out, is now one of the most important industries in India, and its intelligent development would present a new outlet for the vast labour forces of the country, which are at present so largely unemployed or under-employed.]

Harrison (*Shelby M.*). *The Social Survey: the idea defined and its development traced*. Reprinted, with changes, from the introduction to *A Bibliography of Social Surveys*.  $9'' \times 6''$ . 42 pp. New York: Russell Sage Foundation, 1931. 25 cts.

[This is a reprint, in pamphlet form, of the explanatory text which formed the introduction to the *Bibliography of Social Surveys* noticed in the

last number of the *Journal*. The author briefly discusses the aim of such investigations and the value of the results obtained for the guidance of local administrators and social workers. There follows an historical sketch of social surveys, beginning with the researches tentatively undertaken in the 'eighties of last century, and including a fairly full account of the first important American surveys, those of Pittsburgh (1907) and Springfield (1914), with a brief review of the work accomplished since, and a list of surveys which have been completed since the issue of the *Bibliography*. A list of publications on the purposes and methods of surveys is appended.]

*Heichelheim (Fr.)*. Wirtschaftliche Schwankungen der Zeit von Alexander bis Augustus, mit 2 Tafeln.  $9\frac{1}{2}'' \times 6\frac{1}{2}''$ . 142 pp. Jena: G. Fischer, 1930. Rm. 6.

[This is the third volume in the series *Beiträge zur Erforschung der Wirtschaftlichen Wechselagen, Aufschwung, Krise, Stockung*, edited by Prof. A. Spiethoff of the University of Bonn. It is an intensive study of the price fluctuations in some important Hellenistic trade centres during the century and a half under review, and is one of a series of monographs undertaken or contemplated by the author, which on completion should embody material enough to serve as a basis for an economic survey of the Hellenic period as a whole. The four sections of the book deal respectively with: currency in the Hellenic world; fluctuations in the prices of commodities (Delos, Egypt, Italy, and Sicily); land values (Delos, Babylonia, Kurdistan); freights, wages, cost of living, taxation, and movable capital; and the appendix consists of sixteen tables of actual prices—for example, prices of wine, slaves, houses and land in Egypt, Egyptian wheat prices from Alexander to Augustus, daily wages-rates, commodity prices, and rates of tax in Delos. The two diagrams show, respectively, the percentage variations of the most important price series in the several countries during the period 310–151 B.C., and of wheat prices in Egypt from 150–30 B.C., the base of comparison in the first diagram being the price at which the commodity enters the record.]

*Kohn (Stanislas)*. Zaklady Teorie Statisticke Metody (Elements of the Theory of Statistical Method).  $9\frac{1}{4}'' \times 6\frac{3}{4}''$ . xvii + 483 pp. Published in Czech by the State Statistical Office of the Czechoslovak Republic, Prague, 1929. Kč. 80.

[The copy, in Czech, of this text-book of statistics which the author has presented to the Society (we imagine it to have been originally written in Russian) is accompanied by a leaflet in English setting out the contents, with extracts from the Preface, from which the following information is taken. The book is based on University Lectures given by Dr. Kohn at Tiflis, Paris and Prague (where he is now Assistant Professor of Statistics at the Russian Law Faculty). Dr. Kohn finds fault with most existing continental text-books, which either avoid mathematics altogether or assume a mathematical training in their readers which practical statisticians rarely possess. The particular aim of this work is therefore to satisfy the needs of practical statisticians. The mathematical exposition has been kept within the limits of elementary algebra, and where this is impossible, only the result has been given, with its logical justification; the logical rather than the mathematical aspect of the processes employed has, in fact, been emphasized throughout. Referring to the sources on which his work is based, Dr. Kohn pays his chief tribute to the late A. A. Tschuprow and especially to his achievement in the direction of a synthesis of statistical science. On the fundamental concept of probability he "chiefly accepts the views of R. Ellis and J. v. Kries," while "the chapters devoted to the investiga-

tion into 'stochastic' dependence between phenomena are mainly based on the works of K. Pearson and G. U. Yule." The subject-matter of the book is divided into: Statistical description (idiographical use of statistical method) and Statistical investigation of causal relationship (nomothetical use of statistical method).]

The Motor Industry of Great Britain.  $8\frac{1}{2}'' \times 5\frac{1}{4}''$ . 143 pp. London: Society of Motor Manufacturers and Traders, Ltd. 1931. 2s. 6d.

[This annual, compiled by the Statistical Department of the Society of Motor Manufacturers and Traders, is a compendium of figures relating to the industry. The principal sections are: road transport in Great Britain; the British motor market (classified figures of consumption, production, imports and exports); exports of other producing countries; world registrations of vehicles. The first section includes mileage, classification and costs of roads, taxation figures, capacity of motor transport, and road accidents. Imports and exports are classified by countries, and the classes of vehicles are distinguished in these tables and also in those showing world registration and accidents. The principal comparisons are illustrated by graphs.]

Peddie (J. Taylor). The Dual System of Stabilisation. Enlarged 2nd edition.  $8\frac{1}{2}'' \times 5\frac{1}{2}''$ . 250 pp. London: Macmillan, 1931. 15s. net.

[The first issue of this book was noticed in Part IV, 1930, of the *Journal*. The present edition contains nine new chapters, and three more have been amplified by notes. In Chapter XIX Mr. Peddie has endeavoured to meet the criticism generally made by his reviewers, that the nature of his "dual system" had not been made clear. He now confesses that he "required more time for consideration and verification," which may also be deduced from his statement that he has largely rewritten the chapter on agriculture because he has changed his opinion about crop subsidies. Unfortunately he still appears to rely more upon broad assertions, such as "The dual system . . . is the greatest measure yet devised for the advancement of the welfare of mankind," and meaningless ones, such as "the dual system stabilizes all the implications of the quantity theory of money," than upon a concise and statistical exposition of his scheme.]

Robbins (John E.). Hydro-Electric Development in the British Empire.  $7\frac{1}{4}'' \times 5''$ . xix + 143 pp. Toronto: The Macmillan Co. of Canada, 1931. \$1.25.

[The author was the first holder of a Research Fellowship recently established at McMaster University for the study of some portion of the field of British Empire economic development. This book gives, in brief, the results of his research in hydro-electric development in the Empire, which has been carried on under the direction of Professor Humphrey Mitchell and Professor Kenneth W. Taylor. The various countries or regions are considered with respect to the degree of development in relation to the potential power available, and the author discusses the various factors, financial, economic, mechanical, and meteorological, which affect this development. In the final chapter the author briefly sets out his conclusions, which include a plea for the establishment of an "Imperial Water Power Board" as proposed by the Water Power Committee of the Conjoint Board of Scientific Societies in 1921. The book is divided into eight geographical sections, to each of which a bibliography is annexed.]

*Staples (Ronald)*. Back Duty: being a consideration of the law and practice relating to the settlement of liability to income-tax, sur-tax, interest and penalties, where income-tax has escaped assessment at the proper time. 8 $\frac{1}{4}$ "  $\times$  5 $\frac{1}{2}$ ". 112 pp. London: Gee & Co., 1931. 10s. 6d.

[The proface begins engagingly with the statement that "eighty per cent. of the Back Duty settlements in this country are reached as a result of bluff on the part of the Revenue authorities," and the author also refers to the "colossal" ignorance of the taxpayer. This should be enlightened by his clearly written and informative book, although it is mainly designed for those who are called upon to give legal advice respecting claims for back duty. He examines the provisions of the Income-tax Acts, citing cases in illustration, discusses the possibilities of evasion, involuntary and fraudulent, and the methods of investigation likely to be adopted. Appendices consist of (I) the recommendations of the Royal Commission of 1920 on the prevention of evasion, (II) a table showing income-tax and super-tax penalties, (III) rates of income-tax in force since its first introduction in 1798-9; and there is a satisfactory index.]

*Winkler (Dr. Wilhelm)*. Statistisches Handbuch der europäischen Nationalitäten. 9"  $\times$  6". 248 pp. Wien, Leipzig: W. Braumüller, Universitäts Verlagsbuchhandlung, 1931. Rm. 8.20 (gebunden Rm. 10).

[This is the demographical portion of a comprehensive statistical handbook of European minority populations which the Vienna University Institute for the study of Minorities has in preparation. A volume dealing with the economic and cultural aspects will be issued later. The general introduction to the present work includes summary tables showing numbers and percentages of majority and minority populations in Europe, as a whole and in each separate state; also the numbers of each nationality and their distribution in the various countries, whether as majority or minority, the minority groups officially recognized as such by the Geneva Congress being distinguished from the rest. The remainder of the book consists of detailed analyses of the population in each of the European countries. The author, who is Director of the Institute, explains that although the main sources of the data are necessarily the official population statistics of the countries concerned, these have, wherever possible, been checked by comparison with educational and linguistic statistics and by any other means available.]

*Young (Arthur)*. Voyages en France en 1787, 1788 et 1789. Première traduction complète et critique par Henri Sée. 9"  $\times$  5 $\frac{1}{2}$ ". 3 vols. Paris: Librairie Armand Colin, 1931. 160 Fr.

[The first edition of Arthur Young's celebrated *Travels in France* appeared in 1792. It contained the diary of his travels and general observations, and the diary has been frequently reprinted. The only complete edition of his work, however, was that published in two quarto volumes in 1794, which contained much additional matter relating to production, culture, forestry, waste lands and labour. This issue has never been reprinted, and it has been left to a French publisher (Librairie Armand Colin) to produce a complete translation of the whole work in three volumes of nearly 1300 pages. All Arthur Young's notes have been retained, and the editor and translator, Professor Henri Sée, the well-known French Agricultural authority, has enriched the volumes with a long biographical and critical introduction and with voluminous notes. The work will no doubt be the definitive edition of Arthur Young's *Travels in France*.]

*Zagorsky (Simon)*. Wages and Regulation of Conditions of Labour in the U.S.S.R. International Labour Office. Studies and Reports, Series D (Wages and Hours of Work), No. 19. 9 $\frac{1}{4}$ "  $\times$  6 $\frac{1}{2}$ ". 212 pp. Published in the United Kingdom by P. S. King, 1930. 4s.

[This study, to the objectiveness, thoroughness, and impartiality of which Mr. Albert Thomas bears witness in the preface, contains the answer to most questions that could be put respecting wages and the machinery and methods of regulating them in Russia, from the Revolution onwards. The author died shortly after completing the first draft, and it was decided to publish this as it stood and, contrary to the practice of the International Labour Office, under his name, "as a fitting tribute to the memory of a deeply regretted comrade." Part I, on the regulation of working conditions, explains the nature and scope of the regulating authorities and gives details regarding internal regulations, discipline, and individual and collective contracts. Part II deals with wages, their course and their relation to industrial productivity, follows the Government wage policy through its successive stages, and ends with a chapter giving the figures of wage movements, nominal and real, monthly and daily, for men and women and in various industries, during the period 1924-1929. One thing which particularly impresses itself on the reader is the continual frustration, by circumstances and by human nature, of policies of equalization, whether as between grades of work or between different industries, and the way in which the guiding theory has had to be modified from time to time. Unlimited piece-rates, for example, have been largely adopted as the best means of increasing output; it has also been found economically necessary to increase the powers and the pay of management, the wages of skilled as opposed to unskilled labour, and the salaries of certain professional workers, including local statisticians.]

## CURRENT NOTES.

In 1931, as in each of the two preceding years, exports of United Kingdom goods in July showed a substantial increase over those in June, which in each case had reached a lower point than in any other month of the first half-year. That increase in 1929 was 33.3 per cent., in 1930 it was 18.4 per cent. and in 1931 16.4 per cent. Too much must not be made of changes between successive months, for trade is not governed by conventional time-divisions. The aggregate value of British exports in July, 1931, was £34,252,000, about 32.5 per cent. less than the value of those exports in July, 1930, and about 48.5 per cent. less than that of exports in July, 1929. The aggregate value of British exports in the first seven months of 1931 was £233,408,000, about 34.4 per cent., and 45.1 per cent. less than in the corresponding periods of 1930 and 1929 respectively. Export trade in July relative to export trade in the whole seven months was, therefore, rather better in 1931 than in 1930. Gross imports in July, 1931, aggregated in value £70,146,000, an increase of 2.2 per cent. on those for June, substantially the same increase as in 1930 and in 1929, but compared with those for July, 1930, and July, 1929, they showed decreases of 17.6 per cent. and 25.0 per cent. respectively. For the first seven months of the year they totalled £487,934,000, about 22.2 per cent. less than in 1930 and about 30.1 per cent. less than in 1929, so that import trade in July, 1931, was relatively better than in the same month of each of the two preceding years. Re-exports of imported merchandise were, however, on a low level, being £4,936,000 in July, 1931, compared with £6,663,000 in July, 1930, and with £7,970,000 in July, 1929. In each case they were substantially less than in the preceding month, and for the first seven months of 1931 they were £40,644,000 or about 28.3 per cent. and 40.7 per cent. less than in the corresponding periods of 1930 and 1929 respectively. Exports of bullion and specie were in excess of imports in July in each of the three years, the excess being £26,413,000 in July, 1931, £3,301,000 in July, 1930, and £15,885,000 in July, 1929. In the first seven months of 1931 the excess of exports was £12,983,000, which compares with an excess of imports in the first seven months of 1930 amounting to £9,004,000 and with an excess of exports in the corresponding period of 1929 amounting to £14,625,000. Taking merchandise, bullion, and specie together the excess of imports was about £200,900,000 for the first seven months of 1931, about £224,229,000 for the first seven months of 1930, and about £189,744,000 for the first seven months of 1929. The position is, therefore, somewhat better than it was last year, but worse than in 1929. This excess has to be made good by "invisible exports," and,

so far as these are made up of shipping earnings, the amount available is likely to be less this year than in either of the two preceding years. The aggregate tonnage of British vessels cleared with cargoes in the foreign trade was 22,131,000 net tons in the first seven months of 1931, as against 24,923,000 net tons and 25,844,000 net tons in the first seven months of 1930 and 1929 respectively; comparative entrances with cargo were 21,899,000 net tons, 23,513,000 net tons, and 22,982,000 net tons respectively.

Comparing the values of exports of British produce and manufactures in July, 1931, with those in July, 1930, the class of "Food, Drink, and Tobacco" at £2,724,000 showed a decrease of 37·8 per cent.; "Raw Materials and Articles Mainly Unmanufactured" at £3,845,000 were less by 25·6 per cent.; "Articles Wholly or Mainly Manufactured" at £26,508,000 were down by 33·2 per cent., and other items (£1,175,000) were less by 23·3 per cent. The decreases in value extended to all the groups into which exports are divided except "non-metallic mining and quarry products" (other than coal), iron ore and scrap, and textile materials other than cotton, wool, and silk, where the increases aggregated £34,000; the chief decreases were in coal, £1,022,000; iron and steel, £2,295,000; machinery, £1,747,000; cotton goods, £2,094,000; and vehicles (including ships), £1,859,000. Decreases in average values per unit account for a proportion of those declines, but the reductions in quantity were also general and substantial. Exports of coal fell from 4,654,000 tons in July, 1930, to 3,533,000 tons in July, 1931, and bunkers from 1,358,000 tons to 1,163,000 tons; the decreases were spread over all the leading markets, except the Irish Free State, where there was an increase from 193,000 tons to 233,000 tons, while France showed a fall from 1,048,000 tons to 860,000 tons, and Italy from 733,000 tons to 571,000 tons. Exports of pottery fell by nearly a third and those of cement by about 40 per cent. Manufactures of iron and steel decreased from 303,000 tons to 168,000 tons, the fall extending to all classes and including 16,000 tons in galvanized sheets, 13,000 tons in tinplates, 31,000 tons in railway material, and 13,000 tons in steel bars and shapes. Machinery exports were less by 42·4 per cent., having fallen from about 46,000 tons to 26,000 tons. Exports of cotton piece goods were 177·3 million square yards, about half the quantity (355·4 million square yards) exported in July, 1929, and 10·2 per cent. less than the quantity exported in July, 1930. Exports to India were 129,829,000 square yards in July, 1929, 58,182,000 square yards in July, 1930, and 49,482,000 square yards in July, 1931. There were substantial decreases in other important markets such as Egypt, West Africa, Iraq, Dutch East Indies, China, Chile, Uruguay, Argentina, Straits Settlements, Ceylon, Hong Kong, etc.,

but there were increases in Sweden, Norway, Denmark, Switzerland, Turkey, Morocco, Central America, Columbia, Venezuela, British South Africa, Australia, and other British and foreign countries. There was a greater proportional fall in exports of woollen and worsted tissues than in cotton piece goods, namely 13·8 per cent., or from 10,116,000 square yards to 8,720,000 square yards, comparing July, 1930, with July, 1931.

Retained imports of merchandise aggregated £65,210,000 in July, 1931, a fall of about 16·9 per cent. compared with July, 1930; "Food, Drink, and Tobacco" at £33,633,000 decreased by 8·9 per cent.; "Raw Materials and Articles Mainly Unmanufactured," at £11,605,000, fell by 30·4 per cent.; "Articles Wholly or Mainly Manufactured," at £19,341,000, declined by 18·7 per cent., and other items (£632,000) by 16·1 per cent. Here, again, price changes accounted for part of the fall, especially in the case of food-stuffs and raw materials. Gross imports of wheat, for example, fell from 8·7 shillings to 5·1 shillings per cwt., while retained imports rose from 9,537,000 cwt. to 11,937,000 cwt.; gross imports of bacon fell from £4·52 to £2·92 per cent., and retained imports rose from 741,000 cwt. to 909,000 cwt. Retained imports of tea rose from 31,244,000 lbs. to 35,803,000 lbs., but the average value of gross imports fell from 1·24 shillings to 0·98 shillings per lb. There was an increase in retained imports of cotton from 362,000 centals to 490,000 centals, but the average value of the gross imports fell from £3·87 to £2·65 per cental. On the other hand, although the average value of imported raw wool fell from £5·07 to £3·83 per 100 lbs., the retained imports also fell from 31,000,000 lbs. to 20,700,000 lbs., gross imports having decreased by 11·6 per cent. and re-exports having risen by 25·7 per cent. (chiefly to Germany). Retained imports of raw silk nearly quadrupled and those of silk cocoons were also larger. Cottonseed, linseed, and soya beans also showed growth in quantity, as did crude coconut and palm oils. There were small decreases in wet and dry hides, a small decrease in quantity of imports of chemical wood pulp and an increase of about 4 per cent. in mechanical wood pulp. Among manufactured goods, iron and steel manufactures are of particular interest; they increased from 198,100 tons in July, 1930, to 230,500 tons in July, 1931, although, taking together the first seven months of the year, they decreased from 1,723,600 tons in 1930 to 1,502,800 in 1931. There was a moderate decrease in the tonnage of retained imports of semi-manufactured copper, an increase of nearly 140 per cent. in pig and sheet lead, and a reduction of about a third in tin ingots bars, etc., comparing July, 1930, with July, 1931. Gross imports of refined petroleum fell in average value from £20·63 per 1,000 gallons in July, 1930, to



£12.99 per 1,000 gallons in July, 1931, and the quantity retained also fell from 214,386,000 gallons to 147,012,000 gallons.

Movements and Classes.	Twelve Months ending July, 1930.	Twelve Months ending July, 1931.	Increase (+) or Decrease (—).			
<b>Imports, c.i.f.—</b>	£'000.	£'000.	£'000.			
Food, drink, and tobacco	508,568	435,186	— 73,382			
Raw materials and articles mainly un- manufactured	298,933	193,169	— 105,764			
Articles wholly or mainly manufac- tured ...	329,597	266,992	— 62,605			
Other articles ...	12,271	10,662	— 1,609			
Total Imports ...	1,149,369	906,009	— 243,360			
<b>Exports, f.o.b.—</b>						
<i>United Kingdom Produce and Manufactures—</i>						
Food, drink, and tobacco	52,729	41,361	— 11,368			
Raw materials and articles mainly un- manufactured	72,272	51,700	— 20,572			
Articles wholly or mainly manufac- tured ...	514,799	338,349	— 176,450			
Other articles ...	19,885	16,952	— 2,933			
<i>Imported Merchandise—</i>						
Food, drink, and tobacco	25,115	21,662	— 3,453			
Raw materials and articles mainly un- manufactured	43,697	29,773	— 13,924			
Articles wholly or mainly manufac- tured ...	27,720	19,521	— 8,199			
Other articles ...	581	726	+ 145			
Total Exports ...	756,798	520,044	— 236,754			
<b>Bullion and Specie—</b>						
Imports ...	94,616	94,949	— 333			
Exports ...	86,917	111,906	— 24,989			
<b>Movements of Shipping in the Foreign Trade—</b>	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.
<i>Entered with cargoes—</i>						
British ...	31,908	41,278	29,600	39,174	— 2,308	— 2,101
Foreign ...	26,693	22,950	25,197	22,210	— 1,496	— 740
Total entered ...	58,601	64,228	54,797	61,384	— 3,804	— 2,844
<i>Cleared with cargoes—</i>						
British ...	39,812	44,416	36,871	39,828	— 2,941	— 4,588
Foreign ...	23,469	23,638	20,658	21,366	— 2,811	— 2,272
Total cleared ...	63,281	68,054	57,529	61,194	— 5,752	— 6,860

*Prices* : During the months May-July, 1931, wholesale prices of commodities continued to decline, and, as measured by the Board of Trade index-number, were on balance, in July, 1931, nearly 25 per cent. below the level of prices in October, 1929. The fall compared with the preceding month was 1.3 per cent. in May, 1.1 per cent. in June and 1.0 per cent. in July respectively. As compared with April 1931, therefore, the general price level had fallen in July a further 3.3 per cent. All the ten groups of commodities which constitute the index-number shared in the fall, which was greatest in the Woollen group (11 per cent.) and least in " Other Textiles " and " Miscellaneous " (rather more than 1 per cent.). The largest fall in the price of any commodity was in tea, the average price of Indian tea (*London Auctions*) for July, 1931, being nearly 40 per cent. below that for April. There was the usual seasonal fall in the price of house coal.

Taking articles of food and materials separately there has been a fall in July, 1931, as compared with April, 1931, of 2.8 per cent. in articles of food and of 3.7 per cent. in other articles. Taking the whole period since October, 1929, however, the total amount of the fall differs somewhat, being 32.5 per cent. in the groups representing articles of food and 25.2 per cent. in the groups representing materials. Within the broad classification representing food and materials respectively there are considerable variations in the proportionate amount of the decline. While coal has dropped only 7.7 per cent. and iron and steel 10.7 per cent., there was a fall of 34.6 per cent. in the non-ferrous metals group, of 36.5 per cent. in cotton, 37.8 per cent. in wool and 41.1 per cent. in Textiles other than cotton and wool. Cereals fell 38.1 per cent.

The quarterly averages of the monthly index-numbers are given below for the last two years.

(Averages for the Year 1924 = 100.)

Groups.	1929.		1930.				1931.	
	3rd Qr.	4th Qr.	1st Qr.	2nd Qr.	3rd Qr.	4th Qr.	1st Qr.	2nd Qr.
Food ...	87.3	85.8	80.7	76.9	75.6	71.7	67.4	68.0
Not food	79.3	78.1	74.8	71.5	68.1	64.5	62.2	60.2
Total ...	82.1	80.7	76.9	73.4	70.7	67.0	64.0	62.8

If we take the averages for 1913 as 100, the index-number for July 1931 would be 102.2 (food 109.5, not food 98.2).

The *Economist* index-number, which stood at 65.4 at the end of April, 1931 (1927 = 100), had fallen at the end of May to 63.6, a decline of 2.8 per cent. No change took place at the end of June owing to a slight upward movement in certain commodities ascribed to the stimulus to confidence given to markets by Mr. Hoover's moratorium offer. The offer, however, had little effect on some commodities, and at the end of July the index-number had fallen to 62.5, thus registering a decline of 4.4 per cent. over the three months May to July. The fall was heaviest (9.9 per cent.) in articles of food other than meat and cereals and in textiles (7.3 per cent.). Compared with the end of July, 1930, a decline of 19.5 per cent. is indicated, only three articles—oats, potatoes, and house coal—showing a rise in price over the twelve months. The prices of five articles showed no change, while the remaining fifty articles declined in price, and in ten of them the changes varied from 36 to over 50 per cent.

The general trend of wholesale prices as recorded by the *Statist* index-number, after showing a fall of 2.6 per cent. in May, 1931, as compared with prices at the end of April, moved slightly upward at the end of June, a result ascribed to the influence of the Hoover proposals. The downward movement was resumed, however, by the end of July, when the level of general prices was 5.0 per cent. below that of the end of April, 1931; the index-number, calculated for the end of each of the four months April to July, 1931, being 84.4, 82.2, 82.6, and 80.2 respectively. The decline from April to July varied somewhat as between articles of food and materials, being 5.7 per cent. for food and 4.3 per cent. for materials.

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According to the Ministry of Labour, the principal movements in retail prices of articles of working-class consumption were reductions in the prices of tea, butter, bacon, milk and cheese during April, and an advance in eggs during July. There was the usual seasonal advance in potatoes during June due to the marketing of the new crop at higher prices, but part of the advance was lost during June. The result of these and of a few slighter changes was to reduce the Ministry's index-number of retail prices of food, which stood at 129 at the beginning of April and of May, 1931 (July, 1914 = 100), to 127 at the beginning of June. There was a rise to 130 at July 1 owing to the increased price of potatoes and a slight fall at August 1, when the number stood at 128. At August 1, 1930, the number stood at 144. As regards articles other than food there was a slight fall indicated in the prices of coal and clothing, leaving the index-number for all items (food, rent, clothing, fuel, light, etc.) on August 1, 1931, at 145 as compared with 157 at August 1, 1930, and 163 at

August 1, 1929, a fall of 7·6 per cent. over the twelve months and 11 per cent. over the two years. The combined index-numbers calculated for the last four dates were as follows: May 1, 1931, 147; June 1, 145; July 1, 147; August 1, 145.

The following table summarizes for the principal countries the latest information as to retail prices overseas as published in the *Labour Gazette*. The third column gives the estimated percentage increase in retail food prices on those ruling in July, 1914, or some similar pre-war period; the fourth column gives for all items covered by the budget in each case, such items, in addition to food, comprising generally rent, clothing, fuel, etc.

Country.	Date of Latest Return.	Food.	All Items.
	1931.	Percentage Increase.	Percentage Increase
<i>Overseas Dominions, etc.</i>			
Australia ... ..	June	28	35 (4th qr. 1930)
Canada ... ..	June	11	39
India (Bombay) ... ..	July	0	8
Irish Free State ... ..	May	39	56
New Zealand ... ..	June	24	48
South Africa ... ..	June	6	23
<i>Foreign Countries</i>			
Belgium ... ..	July	—	689
Czechoslovakia ... ..	June	19	5
Denmark ... ..	July	19	54
Egypt (Cairo) ... ..	March	24	42
Finland ... ..	June	714	903
France (Paris) ... ..	June	526	489 (2nd qr.)
France (other towns) ... ..	May	507	—
Germany ... ..	July	30	37
Holland (Amsterdam) ... ..	June	—	54
Italy ... ..	July	342	389 (Milan)
Norway ... ..	July	38	67
Spain (Madrid) ... ..	June	89	—
Sweden ... ..	June	30	58
Switzerland ... ..	June	41	50
United States ... ..	June	16	61 (Dec. 1930)

*Employment:* There was a slight improvement during March and April which was chiefly seasonal, but since then there has been a practically continuous rise in the numbers of persons on the registers of Employment Exchanges in Great Britain during the last three months. There have been slight seasonal rises and falls in a few trades, and at three dates (May 18, June 8, and July 6) the numbers on the registers showed a decrease, but at August 17, 1931, the numbers out of work had risen to 2,719,376 as compared with 2,520,113 at the end of April. The numbers for August are the highest yet recorded.

The following table gives the figures for the last recorded date in recent months and for the middle of August, 1930.

Date.	Numbers on Employment Exchange Registers in Great Britain.			
	Wholly Unemployed	Temporarily Stopprd.	Normally in Casual Employment.	Total
April 27, 1931	1,848,170	556,978	114,965	2,520,113
May 18, 1931	1,840,562	550,907	115,468	2,506,937
June 29, 1931	1,847,859	703,660	113,370	2,664,889
July 27, 1931	1,877,543	724,690	111,117	2,713,350
Aug. 17, 1931	1,942,836	664,801	111,739	2,719,376
Aug. 18, 1930	1,312,009	611,785	94,163	2,017,957

The percentage unemployed in all industries insured against unemployment was 20·8 at May 18, 1931, 21·8 at June 22, and 22·6 at July 27, 1931. At July 21, 1930, the percentage was 16·7.

Employment in Germany, according to official reports summarized in the *Ministry of Labour Gazette*, improved slightly during May and June, 1931, but declined somewhat during July; it remained, however, better than at the end of April, 1931. The number of persons reported by the Employment Exchanges as *available for and seeking work* fell from 4,469,474 at the end of April to 4,172,543 at the end of May and 4,082,596 at the end of June, but rose slightly to 4,103,497 at the end of July. The corresponding figures for those reported as *unemployed* were, April, 4,358,153; May, 4,052,950; June, 3,953,946; July, 3, 976,000. Of these, the numbers in receipt of standard and emergency unemployment benefit were 2,507,569, 2,353,657 and 2,231,515 at the end of May, June and July respectively. It would appear that about 60 per cent. of those reported as unemployed are in receipt of benefit. At the end of June 29·7 per cent. of four and a quarter million German trade unionists were reported as wholly unemployed, and 17·7 per cent. as on short time, compared with 19·6 unemployed and 12·6 on short time at the end of June, 1930.

In France, where the numbers of persons on the registers of Employment Exchanges had increased gradually from the middle of 1930 (9,813) to the end of March 1931 (70,822), there was a slight falling off in the numbers recorded during the succeeding four months, and at the end of July the numbers on the registers had fallen to 50,292. These figures, however, are hardly representative, and since the beginning of 1931 a special official investigation has

been made monthly into the numbers employed and hours worked in mining, industrial transport and commercial undertakings employing at least 100 workers. At the beginning of January a decline was shown of 4.2 per cent. in the numbers employed compared with January 1930, and 14.0 per cent. of those employed were found to be on short time. At the beginning of July the decline as compared with a year ago was 7.19 per cent. and 31 per cent. were on short time. On the basis of the January investigation the number of persons wholly unemployed in France at that date was estimated to be 350,000, and those on short time to be 1,000,000. It is evident that employment has declined considerably during the present year, as the percentage employed compared with 1930 has declined month by month and the numbers on short time have averaged over 30 per cent. since the beginning of March.

For Belgium, although the unemployed members of Approved Unemployment Societies have declined since the end of March from 11.6 to 8.9 per cent.—a decline principally seasonal—the rate of unemployment during the first six months of 1931 has averaged 10.2 per cent. compared with 2.4 per cent. in the first half of 1930, with a large increase in the numbers on short time.

In Scandinavian countries there has been a similar worsening of employment, and although a seasonal improvement occurred in the spring months, unemployment was much higher than a year ago. According to trade unions—the chief source of information—13 per cent. of members in Sweden and Denmark were out of work at the end of May compared with 8.1 per cent. and 9.4 per cent. respectively at the end of May, 1930.

According to the Federal Bureau of Labor Statistics of the United States, returns from establishments in various branches of industry and commerce, covering about 4,644,000 workpeople, show that there was a slight increase in the numbers employed in April, 1931 (0.2 per cent.), and larger decreases (0.9 per cent. and 2.0 per cent.) in May and June. The index-number of employment in manufacturing industries (average of 1926 = 100) has (except in February and March of this year) declined steadily since February, 1930, and was in June 72.2 or 15½ per cent. below the figure for a year ago, and 27 per cent. below that of two years ago.

Canadian employment returns, based on similar statistics relating to nearly a million workpeople, show that the index-number of employment (1926 = 100) has risen somewhat since April 1, 1931, when it was 99.7. At May 1 it was 102.2, by July 1, 1931, it had reached 103.8. It is still 13 per cent. below the figures for a year ago (118.9).

The International Institute of Agriculture has been considering the making of a study of price indices of interest to agriculturists, and the Agricultural Economics Committee of the Institute have recommended the publication of index-numbers of prices of agricultural products and of certain factors in production costs, whether constructing such index-numbers itself or utilizing those supplied by other institutions. The first of these two alternatives has presented some rather formidable difficulties. Arrangements would have to be made with the appropriate authorities in the various countries for the establishment of sufficient uniformity in regard to the commodities to be included, the weights to be assigned to each commodity, and the nature of the price quotations to be used. It would then be necessary that each country should communicate to the Institute, promptly each month, the necessary data for the preparation of the index-numbers. For the present, therefore, the Institute has adopted the second alternative, and it will in future publish, in its "Monthly Crop Report and Agricultural Statistics," the index-numbers of prices of agricultural products, together with other price indices of interest to farmers, which are published in many countries. As a preliminary to this step it has published a very valuable guide to the existing agricultural price index-numbers (*Index-Numbers of Prices of Agricultural Products—Methodological Data and Tables*: Bestetti and Tumminelli, S.A. 1930. Price 5 lire). It contains tables showing index-numbers for seventeen countries. Wherever possible the figures are for each of the years 1921 to 1929 inclusive, and an index-number is given for each month as well as for each year, thus forming a starting-point for the monthly figures to be published in future by the Institute. Preceding the tables are statements showing the nature of the data used in the various countries in connection with the index-numbers—the commodities included and their grouping, the prices used (whether market or exchange, etc. prices) and the method of calculation (base period, weights and formula employed). There is also an introductory section which contains an outline of the principles on which the index-numbers of prices of agricultural products are established in the different countries and conveys the warning that the greatest prudence should be exercised in the use of the figures given in the tables, especially in comparisons from an international point of view.

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By the courtesy of the Secretariat of the Conference of Wheat Exporting Countries, which met at Canada House in May, the Society has received a typed copy of the documents before the Conference, with the minutes of the meetings and the press com-

muniqués. The documents include several sets of statistical tables (Documents Nos. 1-6 and 8) showing (1) Yearly averages of areas harvested, production, utilization, population, exports and imports of wheat and wheat flour, 1909-13, 1920-23, 1924-28, rates of production in certain countries and of wheat imported and utilization 1920-30; (2) Monthly prices in Europe, 1925-31; (3) Monthly international trade in wheat and flour; (4) Direction of trade; (5) Visible wheat supply, 1922-31; (6) Conversion tables; (7) Ex-European trade. The other documents include the statement by Mr. McKelvie, of the Federal Farm Board, U.S.A.; papers by Mr. A. N. Duckham on marketing schemes, possible lines of concerted action, and prices of wheat and bread in the United Kingdom; the proposals for organization of world wheat and flour marketing made by the delegates of various countries; and the information furnished by the Soviet and other governments in response to questions addressed to them by the Chairman.

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Since the last issue of the *Journal*, two more numbers of the Ministry of Agriculture's Economic Series have appeared. The Report on the Sugar Beet Industry at Home and Abroad (No. 27) is reviewed elsewhere. The other, No. 28, is a Report on the Marketing of Honey and Beeswax in England and Wales (H.M. Stationery Office, price 6d.). This small section of British agricultural activity is responsible only for an output valued at about £200,000 a year. The Report is mainly, and successfully, intended as a basis on which to build an improved marketing technique, but it also has much to interest the lay reader.

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The February and May numbers of *Human Biology* (Vol. III, Nos. 1 and 2, 1931) contain several papers of statistical interest from the Department of Biostatistics in the School of Hygiene and Public Health of the Johns Hopkins University. In the February issue Dr. Margaret Merrell discusses the relationship between individual growth and average growth. She shows that the average of a series of individual growth curves may differ in certain fundamental characteristics from the separate curves. Therefore when observations on any biological form are taken on different individuals of varying ages and the description of growth is given in terms of the averages of these observations, the form of the growth of these averages cannot be assumed to be characteristic of the growth of the individual organism. The curves may differ as to the number of major cycles in their growth and as to the degree of skewness.

The extent of these differences depends upon the variability of the individuals. In cases of extreme variability, significant undula-



tions may be present in the average which are entirely lacking in the individual growth. To interpret these variations as epochs in the growth of the individual organism, associating them with physiological age changes, would be fallacious, since they are a result of the mathematical process of averaging and have nothing to do with the biology of growth. With the variability ordinarily met with in biological material, which is illustrated in the numerical example given in this paper, these additional fluctuations are insignificant in size. A much more pronounced effect produced by averaging is in changing the degree of skewness in the mean curve, and it is not possible to ascribe the degree of asymmetry observed in a series of averaged measurements to the growth of an individual organism.

To the May number Dr. Haruo Mizushima, using statistics of the various geographical divisions of the United States and Japan, contributes a study of the correlation between the growth rates of population and such vital factors as the death-rate, birth-rate, infant mortality rate, vital index, migration, sex ratio, and density of population. In the same number there is an interesting paper by Dr. I-Chin Yuan, who has calculated life tables for a southern Chinese family whose records date from 1365 to 1914. Modern registration of births, deaths, and marriages was not instituted in China until 1914 and has never been satisfactorily carried out even in the large cities. However, the ancient tradition of keeping an account of the family lineage has been faithfully observed for many centuries. Usually it is the function of the family clan to take a periodical enumeration of its members and issue a new edition of its genealogical record every twenty or thirty years. In this publication, the male lineage of the family is traced from the first ancestor known, giving a personal sketch of each male, recording the name of the father, the title of social distinction, the dates of birth and death and the place of burial, together with a similar description of his wife or wives, including the number of sons and daughters born to each wife. As a rule, those who died unmarried under fifteen years of age are not recorded, probably because they are considered of no importance in the propagation of the family, but the records of those people over twenty years of age are probably reasonably complete, due to the emphasis that is placed on family lineage in China. For the adult population over twenty years of age such records are probably a valuable source of Chinese vital statistics.

The outstanding finding in this investigation is the trend of gradually rising death-rates among the young adult and middle-aged life of both sexes over the period 1365-1849, except for the

century 1600-99, in which the rates are aggravated by warfare. The female mortality rates are higher than the male at younger ages but lower at older ages, except in the period of revolution and warfare.

In comparing these Chinese life tables with Farr's English life table No. 1, the latter shows for both sexes lower mortality rates, more favourable survivorship and greater expectation of life practically at all ages, and especially at the younger ages, except for the period of 1365-1599, in which the Chinese mortality rates are lower.

The expectation of life at age twenty is as follows :—

			Male.	Female.
Born between 1365 and 1599 ...	...	...	37·7	39·7
„ „ 1600 and 1699 ...	..	...	32·9	36·9
„ „ 1700 and 1749 ...	...	...	36·6	38·0
„ „ 1750 and 1799 ...	...	...	34·8	37·6
„ „ 1800 and 1849 ...	...	...	33·7	36·8
(adjusted for survivors)				
English Life Table No. 1: 1841 ...	...	...	39·9	40·8

Reprints of these three papers have been added to the Library.

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In "The Increase in the National Cancer Death-Rate and its Causation" (*Edinburgh Medical Journal*, July 1930) Dr. J. C. Dunlop reviews at length the deaths according to age from cancer in various sites during the periods 1910-12, 1920-22, and 1928 in Scotland, and compares his results with those obtained by him from similar data in England and Wales. Two of his main conclusions were :—

1. There has been during recent years an increase in the cancer death-rate.

2. Of the increase the larger proportion—approximately three-quarters—has been due to an ageing of the population, leading to larger numbers living in those ages in which the cancer death-rate is high.

The basis for the second deduction was apparently afforded by the following figures.

Actual cancer deaths 1910-12 = 5002.

„ „ „ 1920-22 = 5953.

Expected number of cancer deaths in 1921 on the basis of death-rates at ages prevailing in 1910-12 = 5799.

Hence expected difference expressed as a percentage of the actual difference = 83·8 per cent.

We are not, however, convinced that this is the proper method of comparison. Suppose, for example, that the population living in

each age group had increased by the same percentage, say 10 per cent., and that the death rate in each age group from cancer had increased also by 10 per cent., most people would say that none of the increased *rate* of mortality from cancer was attributable to the ageing of the population. Dr. Dunlop would appear to argue that because the absolute increase of deaths, keeping the rates at ages constant, would have amounted to 10 per cent., and the actual increase was 21 per cent., nearly half the increase was due to ageing. The proper method of comparison seems to us to be not of aggregates, but of rates of mortality.

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In "Some Principles of Cancer Statistics Research," Dr. F. L. Hoffman stresses the importance of greater concentration on the study of the mortality according to the site of cancer. In his view "the time has come to recognise clearly that cancer is not an entity, but that each and every type of cancer must be separately considered if useful results are to flow from the investigation." He points out that there are considerable differences in the mortality according to site of cancer throughout the world. For instance, in New Zealand the proportion of deaths from female breast cancer is 20 per cent. of the total cancer deaths, in England the ratio is 17 per cent. On the other hand, he found that this form of cancer was rare amongst Japanese women both in their own country and in the Hawaiian Islands. The author, however, seems under a slight misapprehension as regards the publication of cancer data according to site in England and Wales. The publication of such figures for thirty sites is not a recent practice, as seems suggested, but has been in vogue for nearly thirty years, and in the Decennial Supplement of the Registrar-General for England and Wales, Part II, 1921, the effects of occupation on the incidence of cancer according to site are discussed in much detail.

In his Sixth Preliminary report on the San Francisco Cancer Survey, Dr. Hoffman incorporates two studies. In the first he presents details of 3344 cancer deaths during the period 1923-27, according to the specific organ or part of the body affected. He has analysed the data from the following main aspects:—

- (1) Mean age at death for each of several sites of cancer.
- (2) Duration of the disease.
- (3) Length of residence in San Francisco.
- (4) Frequency of operation.

The mean age at death for males and females was 59.1 years and 58.0 years respectively, and there was considerable variation in the values of the mean ages when the individual sites were examined.

These fluctuations were, no doubt, in part due to small numbers of deaths in many of the sites. As regards the duration of the disease, the average duration was longer for females, 16 months for males as against 21 months for females. The author was at a loss to explain this difference. The most likely explanation is that as cancer of the breast forms a large proportion of the total mortality from cancer amongst females, surgical operation tends at least to postpone the age of death. It was unfortunate that Dr. Hoffman could not estimate his "exposed to risk," and so calculate the mortality rates according to age for specific sites. As he is no doubt aware, conclusions drawn from such values as the mean age of death can be very misleading.

In the second part of the report he presents details of a control series of approximately 1000 patients suffering from chronic diseases of adult life. He finally makes a comparison between the results obtained from this series and those obtained from a similar investigation of cancer patients the results of which were published in a previous paper. He found that the mean age at death was greater for non-cancerous patients than for the cancerous, the values for males being 61.6 and 57.1 years respectively, and for females 53.6 and 52.4.

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In an analysis of 3,122 case histories of diphtheria published in the March number of the *American Journal of Hygiene*, Miss Ida May Stevens has examined the effect of delay in administering antitoxin in California. She also discusses variations in the fatality rates of diphtheria in urban and rural populations and age differences in fatality. It is well known that case fatality in diphtheria increases with delay in administration of antitoxin, and this analysis shows the effect very clearly.

In order to make a comparison with past experience, a series of case histories for pre-antitoxin days was obtained from the Providence Department of Health. In spite of the fact that these data do not form a complete control for the post-antitoxin data for California, the comparison brings out some facts of interest. The chance of dying for each day of illness was computed for both experiences. The chances of dying in the early stage of the disease in the post-antitoxin experience is less than a third of the pre-antitoxin experience, but by the 18th day of illness the chances become about equal. When delay in administering antitoxin is considered, it is shown that if treatment is delayed for 5 days or more the case fatality rate is not significantly different from that of pre-antitoxin days. Miss Stevens finds that rural populations have a higher case fatality than urban populations at all ages under 20 years, but over 20 years

there is no difference between them. With the exception of children under one year, it is shown that in the data studied, the younger the diphtheria patient the less the chance of recovery, regardless of the size of the dose or the delay in giving treatment.

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In a paper entitled "Upper Respiratory Disease (Common Cold) and the Weather," published in the May number of the *American Journal of Hygiene*, Dr. Gafafer discusses the effect of air temperature, rainfall, sunshine, and other measurements of meteorological conditions on the frequency of colds in two groups of volunteers. One group consisted of 350 medical students and staff from the Johns Hopkins University, and the second group was composed of 100 families (covering 500 individuals) in Baltimore. The period of observation extended from October 1928 to April 1930, and the data were analysed in three periods, one warm and two cold periods. Dr. Gafafer attacks his problem by correlating deviations in the weekly attack rate of colds with deviations in air temperature, humidity, wind, and other measurements of weather conditions. He found in the medical group that a fall below the "normal" in temperature or vapour pressure was associated with a slight rise in the attack rate during both cold and warm periods. A fall below the ordinary level in atmospheric pressure or amount of sunshine during the warm period tended to increase the number of colds. Changes in weather condition did not seem to affect the frequency of colds in the family group in the winter, but in the summer a fall in temperature and sunshine appeared to increase the attack rate. Dr. Gafafer concluded that changes in weather during a warm season have probably more effect on the incidence of the common cold than changes in weather during a cold season.

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On the 23rd June 1931 a bill passed the Dominion House of Commons (with little or no debate) which transferred the Canadian Branch of the Royal Mint to the control of the Dominion Government. It will henceforth be manned and governed from Ottawa. In the march of civilization the gold bar has displaced the sovereign; the Refinery is of more importance than the Mint. This particular mint in Ottawa did its best service to the Empire during the War through its Refinery, which turned out gold bars for Imperial service to no less a value than £72,760,943. (See Dr. Bonar's paper in the *Journal* for March 1921.) The transference was foreseen, for the English Act of 1925 had dethroned the gold sovereign and altered the whole situation. Mr. Fielding established the Mint in 1908 in the hope that it would be a great Imperial factory for the coining of sovereigns.

Even Tower Hill coins very few now. Pretoria is left nearly alone. Canada recognizes that the coining of the sovereign is an empty privilege. Perhaps Canada's next step will be reversion, for economy's sake, to the old system of purchasing the token coins from England, and the adaptation of the Mint buildings (including the Bank of England's Refinery) to the pressing needs of the ordinary Civil Service. The old Refinery can still serve the mines of Porcupine and Nova Scotia.

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Mr. Harold Faber, after 42 years' service as Danish Agricultural Attaché in the United Kingdom, has recently retired at the age of 75. He became a Fellow of this Society in 1892, and in 1924 read a paper on Agricultural Production in Denmark which aroused a large amount of interest. His work as a liaison officer between the two countries has been invaluable, and Fellows will wish him all good fortune and happiness in his retirement.

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# STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

## UNITED KINGDOM—

*Annals of Eugenics*, May, 1931—Human fertility in relation to ages of husband and wife at marriage and duration of marriage: *J. H. Müller*. An inquiry into various death-rates and the comparative influence of certain diseases on the duration of life: *M. Noel Karn*. The distribution of cancer and tuberculosis mortality in England and Wales: *Percy Stocks*. On the inheritance of mental disease: *Karl Pearson*.

### *Bankers' Magazine*—

May, 1931—England's crisis. Austria and the "Zollverein": *H. E. Scott*. Some causes of industrial depression, with some suggested remedies.

June, 1931—Industrial depression and the way out. The economic condition of Great Britain: *H. C. Bayldon*. Gold movements in 1930 (with charts): *A. J. Liversedge*.

July, 1931—The banking half-year. Our industrial problems. British savings banks: an historical and statistical survey: *P. G. H. Woodruff*.

*Biometrika*, May, 1931—Tables of the probability integrals of symmetrical frequency curves in the case of low powers such as arise in the theory of small samples: *Karl Pearson* and *B. N. Stoessiger*. Further notes on the  $\chi^2$  distribution: *J. Neyman* and *E. S. Pearson*. The mean and second moment coefficient of the multiple correlation coefficient in samples from a normal population: *John Wishart*.

### *Chartered Surveyors' Institution, Journal*—

May, 1931—Valuations of the assets of public companies: *S. A. Smith*.

July, 1931—Taxation of land values.

*Economic Journal*, June, 1931—The relation of home investment to unemployment: *R. F. Kahn*. Marshall's time analysis: *Redvers Opie*. Labour mobility in South Wales coal industry, 1920-30: *Brinley Thomas*. A study of occupational mobility: *C. T. Saunders*. Mr. Keynes' treatise on money: *Sir Josiah Stamp*. A proposal for a scientific tariff: *E. J. Broster*.

*Eugenics Review*, July, 1931—Heredity and mortality: *W. Palin Elderton*. Population problems: *Eldon Moore*. Some aspects of human biology: *J. A. Fraser Roberts*. Civilization and fertility: *F. H. Hankins*.

*Faculty of Actuaries, Transactions, Part VII*, 1931—Note on the relation between mortality tables which have been graduated by Makeham's law: *A. E. King*.

UNITED KINGDOM—*Contd.*

*Geographical Journal*, July, 1931—The land utilization survey of Britain : *L. Dudley Stamp*.

*Institute of Bankers, Journal*, June, 1931—The monetary character of the present crisis : *Gustav Cassel*.

*Ministry of Agriculture, Journal*, June, 1931—Agriculture in Russia.

*Public Administration*, July, 1931—Recruitment and training of public officials. Papers by *Sir Stanley Leathes*, *A. L. N. D. Houghton*, *M. L. Dhonau*, *H. Grochtmann*, *A. Riess*. Financial control in administration. Papers by *Sir Charles Harris* and *E. Lund*.

*Royal Institution of Great Britain, Proceedings, Part III*, 1931—The internal mechanics of the trade slump : *J. M. Keynes*.

*Royal Meteorological Society, Quarterly Journal*, July, 1931—Some problems of modern meteorology. No. 4. The present position of weather forecasting : *C. K. M. Douglas*.

INDIA—

*Indian Journal of Economics*, April, 1931—Fluctuations of river and economic life in a deltaic region : *Radhakumal Mukerjee*. Kashmir during the Moghul period : an economic survey : *P. N. K. Bamzai*.

AUSTRALIA—

*Economic Record*, May, 1931—Australian monetary policy : *K. S. Isles*. The depression in New Zealand : *G. Lawn*. Australian capital imports, 1871–1930 : *Roland Wilson*. The railway situation in New Zealand : *E. P. Neale*.

UNION OF SOUTH AFRICA—

*Economic Society of South Africa, Journal*, Vol. IV, Part I—The urban native problem : *J. R. Cooper*. The anti-dumping regulations of the South African tariff : *Prof. Plant*. The tariff policy of Great Britain since the war : *H. M. Robertson*.

UNITED STATES—

*American Academy of Political and Social Science, Annals*, May, 1931—Organized commodity markets. Zoning in the United States.

July, 1931—Elements of an American foreign policy. (Whole number.)

*American Economic Review*, June, 1931—The Morris plan : *L. N. Robinson*. Aspects of world war debt payments : *J. L. Boswell*. Gold standard and South America : *G. Subercaseaux*. Stock dividends and the exchange : *A. C. Whitaker*. Gold production and agricultural products : *P. R. Fossum*. National income—a comment : *J. W. Bennett*. A reply : *Willford I. King*.



UNITED STATES—*Contd.*

*American Statistical Association, Journal, June, 1931*—A forecasting index for business: *B. B. Smith*. The test of significance for the correlation coefficient: *E. S. Pearson*. Causes of birth-rate fluctuations: *Harold and Floy Hotelling*. Comments on applications of recently developed theory of small samples: *H. L. Rietz*. A note on small sample theory: *P. R. Rider*. Employment statistics as measures of unemployment: *A. C. C. Hill*.

*Harvard Business Review, July, 1931*—Distribution problems of the oil industry, I: *S. A. Swensrud*. Public utilities in France: *Pierre Jolly*.

*Journal of Political Economy, June, 1931*—The place of agriculture in British national economy prior to Adam Smith: *S. J. Brandenburg*. Savings, investment, and the control of business cycles: *C. O. Hardy*.

*Monthly Labor Review*—

*May, 1931*—Industrial accidents in selected manufacturing industries, 1926-1929. Workingmen's housing in Vienna: *E. L. Harris*.

*June, 1931*—Public old-age pensions in the United States. Strikes and lockouts in the United States, 1916 to 1930.

*Review of Economic Statistics, May, 1931*—Review of the first quarter of the year: *Editorial*. Postal revenues and the business cycle: *J. Bullock, B. Fox, and A. R. Eckler*. Outside bank debits corrected for seasonal variation; monthly and weekly, 1919-31: *Edwin Frickey*.

*Wheat Studies of the Food Research Institute, Stanford University.*—

*May, 1931*—Survey of the wheat situation, December, 1930 to March, 1931.

*June, 1931*—The wheat situation in Scandinavia.

ARGENTINA—

*Revista de Ciencias Económicas*—

*February, 1931*—El proteccionismo azucarero y su fundamento científico: *E. J. Ferrarazo*.

*March, 1931*—La política económica de Gran Bretaña: *J. M. Keynes*. El proteccionismo que necesita y debe darse orgánicamente a la industria azucarera: *E. J. Ferrarazo*.

BELGIUM—

*Bulletin de l'Institut des Sciences Economiques, May, 1931*—Le cycle des affaires de deux entreprises privées et la conjoncture économique de la Belgique de 1921 à 1931: *Gaston Eyskens*. La production et la distribution de l'électricité en Belgique: *E. Bendheim*.

DENMARK—

*Nationaløkonomisk Tidsskrift, Hefte 3, 1931*—Principperne for offentlige driftsvirksomheders Prispolitik og samfundets Kapitaldannelse: *Aksel Andersen*. Gunnar Myrdals Kritik af Nationaløkonomien som Videnskab: *Jørgen Petersen*.

EGYPT—

*L'Égypte Contemporaine*, April, 1931—L'action contre la crise cotonnière en Égypte: *E. Minost*. La crise française de 1926: *P. Dubois-Richard*.

FRANCE—

*Bulletin de Statistique Générale de la France*, April-June, 1931—Les budgets de familles ouvrières aux États-Unis: *Maurice Halbwachs*.

*Journal des Économistes*—

May, 1931—La houille blanche: *R. J. Pierre*.

June, 1931—La généralisation des déficits budgétaires: *E. Payen*. L'Europe centrale et les projets d'Anschluss: *R. J. Pierre*. Le problème de l'or et la Société [des Nations]: *Elemér Hantos*.

July, 1931—Le Japon économique: *R. J. Pierre*. L'Angleterre et la crise: *C. d'Orléans*. L'Institut d'organisation commerciale et industrielle: *Michel Carsow*. Europe centrale: *M. C.*

*Journal de la Société de Statistique de Paris*, June, 1931—La densité de la population et la mortalité: *Pierre Bourdeix*. Du rôle de la statistique en ce qui concerne l'assurance des accidents d'automobiles: *L. De Riedmatten*.

*Revue d'Economie Politique*, March-April, 1931—L'assurance-chômage, cause du chômage permanent. Le chômage en Grande-Bretagne: *F. C. Benham*. Le chômage en Allemagne: *Emil Lederer*. Le chômage en France: *Charles Picquenard*. Un remède monétaire à la crise mondiale du chômage: *Robert Eisler*.

GERMANY—

*Allgemeines Statistisches Archiv*, Heft 2, 1931—Volkszählung und steuerliche Personenstandsaufnahme: *Wilhelm Morgenroth*. Das Frauenwahlrecht in der Statistik: *Dr. Hartwig*. Poststatistik: *Günther Hoellring*. Philosophie der Statistik: *Arnold Schwarz*. Das Statistische Institut an der Universität Paris: *A. Egger*. Die statistischen Jahrbücher im In- und Auslande: *P. Schwartz*. Ueber Bevölkerungsvermehrung: *Gunnar Dahlberg*.

*Blätter für Versicherungs-Mathematik und Verwandte Gebiete*, July, 1931—Das "gerechte" Bausparsystem: *Ismar Behr*. Verkürzung der Wartezeit bei Bausparkassen: *Ulrich Beckerath*.

*Deutsches Statistisches Zentralblatt*, April, 1931—Die Eigenschaften der stabilen Bevölkerung: *Dr. Landsberg*.

*Vierteljahrshefte zur Konjunkturforschung*—

Heft 1, 1931—Die Weltkonjunktur Anfang Juni 1931. Die Konjunktur in Deutschland Anfang Juni 1931.

Heft I, Teil B, 1931—Die Konjunktur einzelner Wirtschaftsweige.

GERMANY—*Contd.*

*Zeitschrift für die Gesamte Versicherungs-Wissenschaft, July, 1931—*

Die neuesten Ergebnisse der deutschen Bevölkerungsstatistik und ihre Bedeutung für das Versicherungswesen: *Karl Freudenberg*. Der Versicherungsbegriff der Wirtschaftswissenschaft: *W. Weddigen*.

HUNGARY—

*Journal de la Société Hongroise de Statistique, No. 1, 1931—*La diminution des naissances et l'allure récente du mouvement de la population en Hongrie: *Gustave Thirring*. Les résultats préliminaires du recensement de la population de Hongrie: *Aloys Kovacs*. La crise économique mondiale, éclairée par la statistique: *Desire Elekes*. Des différences entre la statistique et la statistique mathématique illustrées d'exemples démographiques: *Theodore Szél*. Les enseignements de la statistique de la tuberculose des années de guerre: *Alexandre Korányi*.

ITALY—

*Le Assicurazioni Sociale—*

No. 2, 1931—La disoccupazione agricola nella Gran Bretagna: *D. H. Dinsdale*. Le migrazioni e le previsioni demografiche e sociali: *I. Ferenczi*.

No. 3, 1931—La famiglia italiana nell'assicurazione sociale—I problemi assicurativi della protezione familiare: *Vincenzo Camanni*. L'invalidità giovanile in Gran Bretagna e le misure adottate per combatterla: *Alice Ring*.

*La Riforma Sociale, May-June, 1931—*Il neo-protezionismo del Professor Keynes: *Attilio Cabiati*. Effetti delle fluttuazioni nel potere d'acquisto dell'oro sulla vita economica delle nazioni: *Riccardo Bachi*. Spirito di risparmio e depressione economica: *G. Sacerdote-Iachia*.

*Giornale degli Economisti—*

*April, 1931—*Il quarto teorema di J. S. Mill sul capitale: *S. E. De Falco*.

*May, 1931—*Cicli di produzione cicli del credito e fluttuazioni industriali: *Marco Fanno*. Le legge di sostituzione o di surrogazione: *Umberto Ricci*.

*June, 1931—*Considerazioni sui debiti della Germania e la Bilancia dei pagamenti: *Attilio Cabiati*. L'industria moderna e la funzione del grossista: *Carlo Pagni*.

SWEDEN—

*Ekonomisk Tidskrift, Häft 5, 1930—*Aktuella problem. VII. Sveriges sockerproblem. VIII. De ekonomiska krisernas problem: *D. Davidson*.

SWITZERLAND—

*Journal de Statistique et Revue Économique Suisse, Fasc. 1, 1931*  
—Jahreszeitliche Schwankungen der Sterblichkeit in der Schweiz unter besonderer Berücksichtigung der Temperatur (1901–1929): Vom Eidgenössischen Statistischen Amte. Logik der Statistik: *A. Schwarz*. Kreditpolitik und Weltwirtschaftskrise: *E. Kellenberger*.

RUSSIA—

*Agrar Probleme, Band 3, Heft 1–2*—Die Landwirtschaft der U.d. S.S.R. auf dem Wege der sozialistischen Rekonstruktion: *P. Sawtschuk*. Konjunktur und Landwirtschaft: *M. R. Druschinin*. Die wachsende Bedeutung des Finanzkapitals und des Industrialisierungsprozesses in der deutschen Landwirtschaft: *M. Kemper*.

INTERNATIONAL—

*L'Esprit International, July, 1931*—Le projet austro-allemand d'union douanière: *J. Wolf* and *P. Bernus*.

*International Labour Review*—

*May, 1931*—The present condition of the lignite industry in the various countries. An experiment in the management of Indian Labour: *Albert Howard*. Wages and hours of work in the coal-mining industry in 1929.

*June, 1931*—Some aspects of conditions of employment in the film industry: *Arnold Kohler*. Italian emigration and colonisation policy: *Attilio Oblath*. The relation between industrial production and the workers' disposition to performance in certain important branches of industry: *Otto Lipmann*.

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## LIST OF ADDITIONS TO THE LIBRARY.

Since the issue of Part III, 1931, the Society has received the publications enumerated below :—

## I.—OFFICIAL PUBLICATIONS.

## (a) United Kingdom and its several Divisions.

## United Kingdom—

- Civil Service, Royal Commission on the.* 1929–31. Report.  $9\frac{1}{2}'' \times 6\frac{1}{2}''$ ; viii + 252 pp. London: H.M.S.O., 1931. 3s. 6d.
- Empire Marketing Board.* Production and trade of the following countries :—  
Gold Coast, June 1931, 18 pp.; Mauritius, July 1931, 16 pp.  $9\frac{1}{2}'' \times 7\frac{1}{2}''$ .  
London: H.M.S.O., 1931. 2d. each. (From the Board.)
- Labour, Ministry of.* Port Labour Enquiry. Report.  $9\frac{1}{2}'' \times 6''$ ; 92 pp.  
London: H.M.S.O., 1931. 1s. 6d.
- Overseas Trade, Department of.* Reports on economic conditions in the following countries :—British Malaya (Feb. 1931), 66 pp., 2s.; Czechoslovakia (March 1931), 46 pp., 1s. 6d.; Netherlands (1930), 160 pp., 4s. 6d.; New Zealand (March 1931), 76 pp., 2s.; Roumania (May 1931), 92 pp., 2s. 6d. London: H.M.S.O., 1931.  $9\frac{1}{2}'' \times 6''$ . (From the Department.)
- Trade, Board of.* Report of the Committee on Obsolete Tonnage.  $9\frac{1}{2}'' \times 6''$ ; 22 pp. London: H.M.S.O., 1931. 4d.
- Treasury.* Committee on Finance and Industry. Report.  $9\frac{1}{2}'' \times 6''$ ; vi + 322 pp. London: H.M.S.O., 1931. 5s.
- Committee on National Expenditure. Report.  $9\frac{1}{2}'' \times 6''$ ; 282 pp. London: H.M.S.O., 1931. 4s.
- Unemployment Insurance, Royal Commission on.* First report. Cmd. 3872.  $9\frac{1}{2}'' \times 6''$ ; 74 pp. London: H.M.S.O. 1s.

## (b) India, Dominions, and Protectorates.

## India—

## Meteorological Department—

- Meteorology of the Persian Gulf and Mekran.* B. N. Banerji.  $9\frac{1}{2}'' \times 6\frac{1}{2}''$ ; 65 pp. + charts. Calcutta, 1931. 5s. 3d.
- Memoirs.* Vol. XXV. Part VII. An analysis of the base line values of autographic instruments.  $12'' \times 9\frac{1}{2}''$ ; 26 pp. Calcutta, 1931. 2s.
- Scientific Notes.* Vol. III. No. 24—On the utility of observations of barometric characteristics and tendencies for local forecasting in North-West India. 14 pp. 10d. No. 25—Heights of base clouds in India as determined from pilot balloon ascents. 6 pp. 6d. Calcutta, 1931.  $10'' \times 7''$ .
- Punjab.* Board of Economic Enquiry. Rural Section publications. No. 21—Farm accounts on the Punjab, 1928–29. 256 pp. 2 Rs. No. 22—Report on a preliminary survey of the milk supply of Lyallpur in 1927. 26 pp. 4 as. Lahore, 1931.  $9\frac{1}{2}'' \times 6\frac{1}{2}''$ .

## New Zealand—

- Census and Statistics Office. Population census, 1926. Vol. XII. Families and households.  $12'' \times 9\frac{1}{2}''$ ; 38 pp. Wellington, 1931. 2s.

## (c) Foreign Countries.

**Austria—**

*Vienna.* Statistisches Amt. Statistisches Taschenbuch für Wien. 5 Jahrgang, 1930. 5½" × 4½"; vii + 84 pp. Vienna, 1931. S. 1.50.

**Brazil—**

Ministerio da Agricultura, Industria e Commercio. Instituto de Expansão Commercial. Brazil of to-day. Economic forces—development. 10½" × 7½"; 180 pp. Rio de Janeiro, 1930.

**Germany—**

Statistisches Reichsamt. Statistik des deutschen Reichs, Band 419. Die Gebrechlichen im deutschen Reich nach der Zählung von 1925–26. 13½" × 10½"; 346 pp. Berlin: Reimar Hobbing, 1931. 11 Rm.

*Frankfurt am Main.* Statistisches Amt. Tabellarische Übersichten betreffend den Zivilstand der Stadt in den Jahren 1926–30. 10½" × 7½"; xxxvi + 113 pp. Frankfurt, 1931.

**Greece—**

Statistique Générale de la Grèce. Annuaire statistique de la Grèce, 1930, Année I. 9½" × 6½"; xviii + 494 pp. Athens, 1931.

**Italy—**

Direzione Generale delle Dogane e Indirette. Ufficio di Statistica. Statistica delle imposte di fabbricazione dal 1º luglio 1929 al 30 giugno 1930. 12½" × 9½"; 222 pp. Rome, 1931.. 15 lire.

**Russia—**

*Ukraine.* Académie des Sciences. Matériaux sur la mortalité en Ukraine. Décédés de la Ville de Kieff selon les causes de décès, le sexe et l'âge. 1918–27. 12" × 9"; 125 pp. Kiev, 1930.

**Sweden—**

K. Socialstyrelsen. Arbetslösheten inom fackförbunden samt därmed sammanhängande bestämmelser i föbundsstadgar och kollektivavtal. 9½" × 6½"; xiv + 152 pp. Stockholm, 1931. 1 kr.

Sveriges Riksbank. Statistiska tabeller 1668–1924 utarbetade av Riksbankens Statistiska Avdelning. 11" × 7½"; 221 pp. Stockholm, 1931.

**Switzerland—**

Bureau Fédéral de Statistique. Statistique des cultures de la Suisse (d'après le recensement des exploitations agricoles du 22 août 1929). 11½" × 8½"; 25 + 223 pp. + 10 maps. Bern, 1931.

**United States—***Agriculture, Department of—*

Farmers' Bulletin, Nos. 1645—Sugar-beet growing under irrigation in the Utah-Idaho area. 33 pp. 10 c. 1658—Farm water power. 22 pp. 10 c. Washington, 1931. 9" × 6".

Guam Agricultural Experimental Station, 1929, Report. 9" × 6"; 20 pp. Washington, 1931. 5 c.

Statistical Bulletin No. 32. Stumpage and log prices for the calendar year 1928. 9" × 6"; 25 pp. Washington, 1931. 10 c.

*Census, Bureau of the.* Fifteenth census of the United States: 1930. Vol. I. Population. Number and distribution of inhabitants. 9" × 5½"; 1268 pp. Washington, 1931. \$2.

*Labor Statistics, Bureau of.* Bulletin. Nos. 535—Wages and hours of labor in the slaughtering and meat-packing industry, 1929. 9" × 5½"; 122 pp. Washington, 1931. 20 c. 538—International Association of Public Employment Services. 17th annual meeting Sept. 1929. 18th annual meeting Sept. 1930. 9 × 5½"; 212 pp. Washington, 1931. 35 c.

*Women's Bureau.* Bulletin. Nos. 85—Wages of women in 13 States. 213 pp. 35 c. 86—Activities of the Women's Bureau of the United States. 15 pp. 5 c. Washington, 1931. 9½" × 5½".

## (d) International.

## International Labour Office—

Unemployment problems in 1931. Studies prepared by the International Labour Office in collaboration with Professors Ansiaux, Cole, Harn, and Hersch. (Studies and Reports, Series C, No. 16.)  $9\frac{1}{2}'' \times 6\frac{1}{4}''$ ; iv + 280 pp. Geneva: (London: P. S. King), 1931. 6s.

## League of Nations—

## Economic and Financial Section—

Bulgarian refugees, Settlement of. 18th report of the Commissioner of the League in Bulgaria.  $13'' \times 8\frac{1}{4}''$ ; 22 pp. Geneva (London: Allen & Unwin), 1931.

Economic Committee. The agricultural crisis. Vol. I.  $10\frac{1}{4}'' \times 8''$ ; 322 pp. Geneva (London: Allen & Unwin), 1931. 7s. 6d.

— Report to the Council on the work of the thirty-fifth session.  $13'' \times 8\frac{1}{4}''$ ; 29 pp. Geneva (London: Allen & Unwin), 1931.

Gold Delegation of the Financial Committee. Selected documents on the distribution of gold.  $9\frac{1}{4}'' \times 7\frac{1}{2}''$ ; 67 pp. Geneva (London: Allen & Unwin), 1931. 2s.

International Agricultural Mortgage Credit Company. Convention, charter, and statutes, approved by the Council of the League, and other relevant documents.  $13'' \times 8\frac{1}{4}''$ ; 37 pp. Geneva (London: Allen & Unwin), 1931. 1s. 6d.

International trade and balances of payments, Memorandum on. 1927-29. Vol. II. Balances of international payments.  $10\frac{1}{2}'' \times 8''$ ; 215 pp. Geneva (London: Allen & Unwin), 1931. 6s.

Second International Conference with a view to concerted economic action (second session).  $13'' \times 8\frac{1}{4}''$ ; 38 pp. Geneva (London: Allen & Unwin), 1931. 1s. 6d.

Statistical Year-book of the League of Nations, 1930-31.  $9\frac{1}{2}'' \times 7\frac{1}{2}''$ ; 292 pp. Geneva (London: Allen & Unwin), 1931.

## Political Section—

European Union, Commission of enquiry for. Economic depression. 16 pp. 6d. Unemployment. 20 pp. 9d. Geneva (London: Allen & Unwin), 1931.  $13'' \times 8\frac{1}{4}''$ .

## II.—AUTHORS AND MISCELLANEOUS.

Andréuès (A.). La population du Japon.  $9\frac{1}{2}'' \times 6\frac{1}{4}''$ ; 52 pp. Reprint from *Revue Economique Internationale*. Jan. 1931. (From the Author.)

Axel Danielssons Statistiskobservatorium. Motion N:R. 173 till Landsorganisationens Kongress från Svenska Sägverksindustri-Arbetareförbundets avdelning N: R. 151 i luvudden.  $9\frac{1}{4}'' \times 6''$ ; 8 pp. Stockholm: A-B Arbetsarnes Tryckeri, 1931. (From Dr. Thor. E. Andersson.)

Banca d'Italia. Adunanza generale ordinaria degli azionisti tenuta in Roma il giorno 28 marzo 1931. Anno Trentasettesimo.  $11'' \times 8''$ ; 163 pp. Roma, Tipografia della Banca d'Italia, 1931.

— Abridged translation of the report of the Governor at the general meeting of the shareholders of the Banca d'Italia held in Rome 28 March 1931.  $10\frac{1}{2}'' \times 7\frac{1}{4}''$ ; 25 pp.

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## ANNUAL LIST OF ADDITIONS TO THE LIBRARY.

Since the issue of Part IV, 1930, the Society has received, by presentation or purchase, the periodical (official and other) publications enumerated below.

### (a) United Kingdom and its several Divisions.

#### United Kingdom—

Bankruptcy, Report. Board of Trade Journal, 1930-31. Companies Report, 1929. Crown Lands, Report, 1930. Customs and Excise, Report, 1929-30. Development Commission, Report, 1929-30. Electricity Commission: Report, 1929-30. Factories and Workshops, Report of Chief Inspector, 1929. Finance Accounts, 1929-30. Fleets, 1931. Friendly Societies, Report, 1929-30. Gas Undertakings, Authorised, Return 1929. Health of the Air Force, 1929. Army, 1929, and Navy, 1929. Imperial Institute, Report, 1930. India, Progress and Condition. Industrial Insurance, Report of Commissioner, 1929. Inland Revenue, Report of Commissioners, 1929-30. Labour Gazette, 1930-31. Labour, Ministry of, Report, 1930. Licensing Statistics, 1929. Medical Research Council Report, 1929-30. Mineral Industry of British Empire and Foreign Countries, Statistical Summary, 1927-29. Mines Department: Report, 1929, 1930. List of Mines, 1929; Fatal Accidents, 1929; Report of Electrical Inspector, 1929. Mint Report, 1929. National Debt Returns. Navigation and Shipping, 1929. Railway Accidents, 1929. Railways, Capital, etc., 1929. Road Fund Report, 1929-30. Shipping Casualties and Deaths on Vessels, 1929. Statistical Abstract for the United Kingdom, 1913-29. Statistical Abstract for British Empire, 1929. Trade: Annual Statement, 1929, 1930 Pt. III. Monthly Trade Returns; Quarterly Returns of Trade and Commerce of Foreign Countries and British Possessions. War Office Library, Annual Supplement to Subject Index, 1930. Workmen's Compensation Statistics, 1929.

#### England and Wales—

Agricultural Statistics. Agricultural Market Report (weekly). Agriculture, Ministry of, Journal (monthly). Ecclesiastical Commissioners, Report, 1929. Education, Report of the Board of, 1930. Education Statistics, Health Ministry: Annual Report, 1929-30. Annual Report of Chief Medical Officer, 1929; Health of School Child. Judicial Statistics: Civil, 1929; Criminal, 1929. Local Taxation Returns, 1928-29 Pt. I. Poor Law Relief Returns (quarterly). Prisons, Report of Commissioners, 1928. Registrar-General: Statistical Review, 1929; Quarterly and Weekly Returns.

*London.* L.C.C.: Annual Report, 1929; Gazette; London Statistics, 1928-29; Statistical Abstract, 1929. Metropolitan Asylums Board, Report for 1929-30. Metropolitan Water Board, Report, 1929-30. Borough Accounts: Acton, Battersea, Hammersmith, Islington. M.O.H. Reports: Paddington.

*Municipal and other local returns.* Accounts, 1929-30. Birmingham, Carlisle, Hull, Ipswich, Leicester, Liverpool, Nottingham, Southgate, Tunbridge Wells. M.O.H. Reports, 1929-30: Birkenhead, Birmingham, Derby, Liverpool, Manchester, Wolverhampton.

Mersey Docks and Harbour Board, Accounts, 1929-30.

University Calendars, 1930-31: London, University College, Manchester, University College of Wales.

(a) **United Kingdom and its several Divisions—Contd.****Scotland—**

Agriculture, Board of: Report; Agricultural Statistics, 1929. Education Reports, 1929–30. Health, Dept. of, Report, 1930. Judicial Statistics, 1929. Local Taxation Returns, 1928–29. Prison Commissioners, Report. Registrar-General, Annual Report, 1929; Quarterly and Weekly Returns. *Edinburgh.* Municipal Accounts, 1930. *Aberdeen.* M.O.H. Report. *Glasgow.* M.O.H. Report.

**Northern Ireland—**

Registrar-General: Annual Report, 1929; Quarterly Returns. Queen's University Calendar, 1930–31.

*Miscellaneous Periodical Publications, issues of 1930–31.*

Accountant. Accountants' Magazine. Annals of Eugenics. Auctioneers' and Estate Agents' Institute, Journal.

Banking Almanack. Banker's Magazine. Barclays Bank Monthly Review. Barclays Bank (Dominion and Overseas) Monthly Trade Cables. Biometrika. Brewers' Almanack and Wine and Spirit Trade Journal. British Association, Report. British Library of Political Science, Bulletin. British Waterworks Association, Official Circular. Broomhall's Corn Trade Year-book. Burdett's Hospitals and Charities.

Carnegie United Kingdom Trust, Report. Chamber of Shipping, Annual Report. Chartered Institute of Secretaries, Proceedings, etc. Colliery Guardian. Commercial World. Co-operative Congress, Annual Report. Corporation of Foreign Bondholders, Report. Cotton Trade Statistical Bureau, Monthly and Quarterly Bulletin. Cremation Society, Transactions. Daily Mail Year-book.

East India Association Journal. Economica. Economic Journal. Economist. Eugenics Review.

Faculty of Actuaries, Transactions and Lists of Members. Financial Review of Reviews. Fireman.

Illuminating Engineer. Institute of Actuaries, Journal and List of Members. Institute of Bankers, Journal. Institute of Chartered Accountants, List of Members. Institution of Civil Engineers, Proceedings, List of Members. Iron and Steel Institute, Journal.

King Edward's Hospital Fund: Annual Report, Statistical Summary.

Land and Liberty. Liverpool Cotton Association, Annual and Weekly Circulars. Lloyds Bank Monthly Review. Lloyds Register: Annual Report, Ship-building Returns, Wreck Returns. London and Cambridge Economic Service, Publications. London Bankers' Clearing House, Report. London Chamber of Commerce, Journal.

Manchester Guardian, Commercial; and supplements. Manchester Statistical Society, Transactions. Municipal Year-book.

National Federation of Iron and Steel Manufacturers, Statistical publications. National Temperance Quarterly. Nature.

Peabody Donation Fund, Report of Governors. People's Year-book. Post Magazine: Post Magazine Almanack. Public Administration, Journal of. Public Health. Publishers' Circular.

Quarterly Journal of Mathematics.

Royal Agricultural Society of England, Journal. Royal College of Physicians of London, List of Fellows, etc. Royal College of Surgeons of England, Calendar. Royal Empire Society, United Empire. Royal Geographical Society, Geographical Journal. Royal Meteorological Society, Meteorological Journal. Royal Sanitary Institute, Journal. Royal Society, Proceedings. Royal Society of Arts, Journal. Royal Society of Edinburgh, Proceedings. Rubber Growers' Association, Report.

(a) United Kingdom and its several Divisions—*Contd.*

Scottish Chartered Accountants, Official Directory. Secretary. Secretaries' Association, Year-book. Signal. Society of Incorporated Accountants and Auditors, Year-book. South Wales Coal Annual. Statesman's Year-book. Statist. Statistical and Social Enquiry Society of Ireland, Journal. Stock Exchange Gazette. Stock Exchange Official Intelligence. Surveyors' Institution Journal.

Times, and Supplements. Tin. Trade Circulars (Bullion, Cotton, Iron and Steel, Meat, Tea, Wool, etc.). Tropical Agriculture.

Vacher's Parliamentary Companion.

Wallis' Index Cotton Circular. Westminster Bank Review. Whittaker's Almanack. Who's Who.

Year-book of Learned Societies.

## (b) India, Dominions, and Colonies.

## India, British—

Statistical Abstract, 1919-20 to 1928-29. Banks, Statistical Tables. Coal Statistics. Coffee Statistics. Cotton Spinning, monthly returns. Currency, Report of Controller. Mines, Report of Chief Inspector, 1929. Tea Statistics. Trade: Review, 1929-30. Seaborne Trade and Trade by Land, monthly returns. Annual Statement, 1929-30.

*Assam.* Administration Report, 1929-30.

*Bengal.* Administration Report, 1929-30. Maritime Trade.

*Bombay.* Labour Gazette.

*Punjab.* Public Health Report, 1929.

Indian Journal of Economics.

Indian Chamber of Commerce, Calcutta, Annual Report, 1929.

## Irish Free State—

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(b) **India, Dominions, and Colonies—Contd.****Canada, Dominion of—**

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Royal Society of Canada, Transactions. Royal Bank of Canada: Report for 1930: Monthly Letters.

**Ceylon—**

Administrative Reports, 1929. Blue Book. Railways (Government) Report, 1929. Papers laid before Legislative Council.

**Federated Malay States—**

F.M.S. Government Gazette; and Supplements.

Manual of Statistics, 1930.

**Jamaica—**

Vital Statistics, 1929.

**Malaya—**

Imports and Exports, Annual and Monthly Returns.

**Mauritius—**

Blue Book for 1929.

**New Zealand—**

Official Year-book for 1931. Monthly Abstract of Statistics.

Agricultural Statistics, 1929-30. External Migration. Factory Production, 1929-30. Friendly Societies, 1929. Insurance Statistics, 1929. Judicial Statistics, 1929. Local Authorities Handbook, 1931. Pensions Department, Reports, 1929-30. Prices, Wages and Hours of Labour, 1929. Trade and Shipping Statistics, 1929, Part II; 1930, Part I. Population and Buildings Report, 1929-30. Vital Statistics, 1929.

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New Zealand Institute, Proceedings.

Wellington Harbour Board Accounts, 1929-30.

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Trade Supplement to Nigeria Gazette (monthly).

**Rhodesia—**

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**Uganda Protectorate—**

Blue Book, 1929. •

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**Argentine Republic—**

- Anuario del Comercio exterior, 1928-29 (Preliminary 1929-30).  
*Buenos Aires*. Revista de Estadística Municipal.  
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 Economic Review. Revista de Ciencias Económicas (monthly).

**Austria—**

- Statistical Handbook, 1930. Agricultural Statistics, 1929. Trade Returns, 1930. Vital Statistics, 1929.  
*Vienna*. Mitteilungen aus Statistik und Verwaltung. Statistical Year-book, 1929. Statistical Pocket-book for Vienna, 1930.  
 Statistische Nachrichten (monthly); Monatsberichte des Instituts für Konjunkturforschung.

**Belgium—**

- Statistical Year-book. Annual Returns relating to: Agriculture and Livestock, 1930. Factory Inspection. Industrial Accidents. Trade, Annual, 1928, and Monthly.  
 Bulletin Trimestriel. Revue du Travail (monthly).

**Brazil—**

- Trade Returns, 1930-31 (sheets), Shipping, Banking (1 vol.), 1927-28.  
*Pernambuco (State)*. Statistical Year-book.  
*Rio de Janeiro*. Health Office Bulletin (weekly and monthly).

**Bulgaria—**

- Statistical Year-book, 1929-30. Annual Returns relating to: Agriculture, 1929; Co-operation, 1928; Crime, 1927; Education, 1926-28; Trade, 1929; Vital Statistics, 1925-6.  
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 Agriculture, 1929-30. Banking Statistics, 1930. Demography, 1929.  
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 Estadística Chilena (monthly). Junta de Beneficencia: Statistical Year-book, 1929.

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- Aperçu Statistique, 1930.  
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**TABLE 2**

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